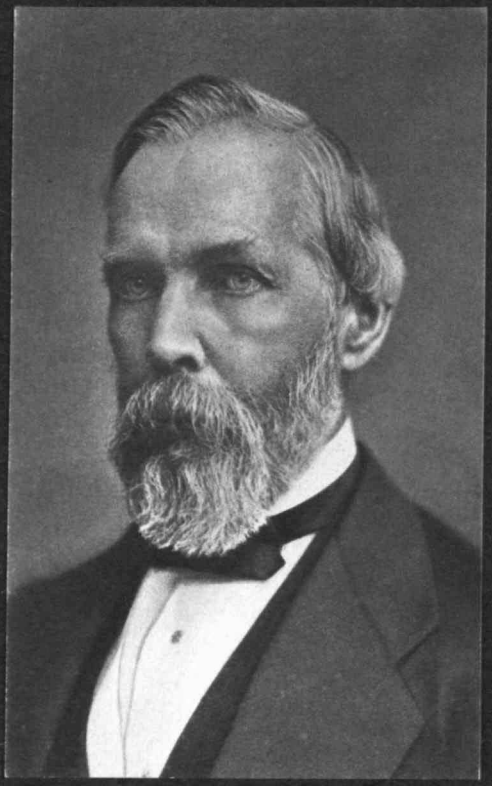

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JOHN BENJAMIN HENCK

Professor of Civil and Topographical Engineering, 1865 to 1881

John B. Henck, for many years Professor of Civil Engineering at the Massachusetts Institute of Technology, and author of the well-known "Field-book for Railroad Engineers," died at his residence at Montecito, California, on January 3.

Professor Henck was born at Philadelphia, October 20, 1815, the son of George Daniel and Caroline Spiess Henck. Both his parents were Germans, but had lived for many years in Philadelphia. His father died in 1831, leaving a widow and eight children, the oldest son being but seventeen years of age. The subject of this sketch prepared for college mainly by home study, being determined to have the best education within his reach. He entered Harvard, and, notwithstanding the fact that he found it necessary to add to his resources by tutoring, he made a record for scholarship which few have surpassed, graduating in 1840 with the degree of A.B., as valedictorian of his class. While he showed unusual excellence in his mathematical work, and was a favorite pupil of Professor Benjamin Peirce, yet his scholarship was remarkably even in all the branches which in those days constituted the college course, literature, philosophy, and the classics being subjects in

which he was much interested and very successful. Among his classmates at Harvard may be mentioned Judge J. C. Bancroft Davis, the late W. G. Russell of Boston, also William A. Crafts, the secretary of the Massachusetts Railroad Commission, and the late Samuel Kneeland, for many years his colleague at the Institute.

After his graduation he was for a year principal of the Hopkins Classical School in Cambridge, Mass. In 1841 he went to the University of Maryland, as Professor of Latin and Greek in the Academical Department, a position which he occupied till 1843, when he returned to Germantown to accept a similar position in the old Germantown Academy, where he remained till 1848.

In the year of his return to Philadelphia, 1843, he was married to Mary A. Kirby, the daughter of an old Quaker family of that city; and two sons were born there. He found the financial outlook on the teacher's salary of those times not sufficiently encouraging for a man with a growing family, and decided to turn his mathematical abilities to account in the field of civil engineering.

Accordingly, in 1848 he entered the office of Felton & Parker, civil engineers, in Charlestown, Mass., now a part of the city of Boston. Mr. Felton of this firm was the engineer for the Fitchburg Railroad; and Mr. George Y. Wellington, now living in Arlington, Mass., was the division engineer in charge of double-tracking the road, with headquarters at Fitchburg. With this firm Professor Henck had his first engineering experience. After remaining in the office about a year, he was sent to join Mr. Wellington's party at Fitchburg, where he stayed until 1850. In that year he formed a partnership with Mr. William S. Whitwell, who had been employed in the construction of the Cochituate Water-works, under the firm

name of Whitwell & Henck, with offices at 41 State Street, Boston, the site of the present Exchange Building. This firm carried on a general engineering business, and had work to do in connection with the construction of the first street railways in Boston. In 1859 Mr. Whitwell retired from the firm to become treasurer of the Boston & Roxbury Mill Corporation, and Mr. Henck carried on the business alone.

Probably the most important work which was undertaken by Mr. Henck's firm, and by Mr. Henck personally, was in connection with the filling-in and improvement of what is now the Back Bay District in Boston. This work was carried on by the Commonwealth of Massachusetts; and the firm of Whitwell & Henck was employed to do the engineering work, beginning in 1855. The work was under the direct authority, first, of the Commissioners of the Back Bay, then of the Land Commissioners who had succeeded to the duties of the first-named board, and finally, in 1879, of a Board of Harbor and Land Commissioners, upon whom all work pertaining to harbors and public lands was finally concentrated. Mr. Henck continued in the employ of all these boards up to the year 1881, having charge of the work of filling-in the land, laying out and paving the streets, and laying out the house-lots as fast as they were sold by the Commonwealth. It will interest many engineers to know that the late A. M. Wellington, who so ably edited *Engineering News* for many years, was an articled student in Professor Henck's office from 1863 to 1866.

About the time of his appointment by the Commission, he took up his residence in Dedham, where he lived for ten years, and where a third son and a daughter were born.

In the years of labor which preceded the establishment of the Institute of Technology, Professor Henck took a

warm interest in the plans of President Rogers; and when the actual work of instruction was begun, in 1865, he willingly assumed charge of the Department of Civil ngineering, of which he remained the head until 1881, when he retired. In those early days, when the means of the Institute were scant and the number of teachers small, the work of instruction took practically all his time, although he still carried on more or less outside work, principally in the laying out of the Back Bay lands. In 1881, after retiring from the Institute and from all active business, he went abroad and spent the next three years travelling in Europe. Returning in 1884, he spent about a year in this country, and then went abroad for another year, after which he finally settled at Montecito, near Santa Barbara, Cal., where he passed the remainder of his life in quiet and retirement.

The principal work of Professor Henck's life was undoubtedly that in connection with his professorship at the Institute of Technology. He established the department of Civil Engineering, organized the course of study, and determined the character of the instruction. To him perhaps more than to any other one man is due the high standard of scholarship and attainment which was set by the Institute, and which soon gave the school the enviable reputation which it has ever since maintained. Professor Henck was pre-eminently a teacher rather than an engineer, and it is as a teacher that he will be longest remembered and that his influence has been most felt. He was a man of broad mental grasp and distinctly a scholar, in the old-fashioned meaning of the word. His principal characteristics, which impressed themselves upon his students, were thoroughness and accuracy. He would tolerate no slipshod methods, but insisted upon a thorough and careful

working out of each problem. He knew the distinction between teaching and merely giving information, and the students in his classes were made to reason and think for themselves instead of having their minds simply filled with facts. His own professional work was characterized by the same care and accuracy. In the work of laying out the Back Bay, and especially in laying out the house-lots, although the land was quite valuable, selling for from one dollar to five dollars per square foot, no question was ever raised as to the accuracy of his work. Indeed, he was, if anything, too particular and too accurate. The only professional criticism that could be made of him was that he sometimes carried refinements too far. The students used to say, jokingly, that Professor Henck corrected his pacing for temperature. He did not possess the quick decision, the intuitive perception of the practical relations of things, or the ability to make a quick and accurate guess which characterizes most engineers. He was constitutionally unable to approximate, or to give a snap judgment, or to form a quick decision. It was always necessary for him to work a thing out thoroughly and accurately. He had, however, an exceptionally clear and original mind, and was exceedingly methodical in his work; and, in working out his problems, he frequently devised new and simple methods of computation, which resulted in great saving of time, combined with increased accuracy. This is true in regard to his methods for computing earthwork, which he devised while engaged upon the Fitchburg Railroad, and the value of which was at once appreciated by the other engineers upon the work. The rough work necessary in supervising construction, however, did not appeal to him; and in carrying out the fieldwork of construction his associates generally considered him too particular, and thought that he required

them to make the measurements with a great deal more accuracy than was warranted by the conditions. All this goes to show why Professor Henck found his most congenial occupation and did his greatest work in connection with his professorship at the Institute.

He will be remembered with affection and respect by scores of former students, who have long ago forgotten what at the time they called his "fussiness," and who only remember his kindness of heart, his clearness of exposition, the thoroughness of his teaching, and the high ideals which he set for himself and for them. Many of them owe more to him than they realize. It is a human characteristic to exaggerate the importance of that which we do not possess and to underrate the importance of that which is given to us. Habits of careful thought, of methodical work, and of accuracy, upon which Professor Henck laid so much importance, have undoubtedly done much to make the success in life of those who came under his influence, and should always be gratefully remembered by them. As the first professor of civil engineering in one of the oldest of our engineering schools, his services, not only to his students, but to the cause of engineering education, should not and will not soon be forgotten by those who knew him, or who are in a position thoroughly to appreciate his character, his aims, and the results of his labors.

Professor Henck was probably best known to the engineering profession as the author of his "Field-book for Railroad Engineers," first published in 1854, and revised and enlarged in 1891 and in 1896. This little book was a perfect model of careful, methodical, and concise mathematical presentation. In these respects it has never been excelled, and it stands to-day as a sample of what should be the ideal in books of this kind. It went through many

editions, and will probably continue for some time to be a necessary part of the library of every railroad engineer. It is thoroughly typical of the man, and any one who is familiar with it can form a fair conception of his mental charac teristics. His calculation and computation books, showing the work of his old firm and his own work when he succeeded to the business, are likewise models of clearness, and can be taken up to-day and read and understood by anybody.

Professor Henck received the degree of A.M. from Harvard University in 1843, and was a Fellow of the American Academy of Arts and Sciences. He contributed several papers on mathematical subjects to the *Mathematical Monthly*, under the editorship of Professor Runkle, with whom he early became intimate. The death so near together of these two men, who were for so many years associated in the early days of the Institute and as colleagues in its Faculty, must recall to us that few are left of those who took part in the establishment of the Institute, and who went through with the trials and tribulations incident to the successful launching of what has become perhaps our foremost engineering school.

During the years of his residence in California several of the older graduates and teachers of the Institute have had the pleasure of seeing their old teacher and colleague, and have always been received by him with cordiality and affection. During these years of quiet he indulged a long-cherished desire to have the use of an astronomical observatory of his own; and in the small observatory which he put up he passed a great many pleasant hours in what had always been a favorite study and amusement with him. He retained his faculties to the last, and was dressed and out of his room on the last day of his life; but he had been

failing for some time, and finally passed away from a sudden collapse of the whole system. He had had a long life, singularly free from illness of any kind, and is survived by two sons and a daughter.

GEORGE F. SWAIN, '77.

FIRE INSURANCE ENGINEERING

Fifty years ago the Fire Insurance Engineer was unknown. He is the product of an era of development in the insurance business, in which science has been replacing chance as the basis of underwriting. Up to the middle of the nineteenth century, underwriters would accept a policy on almost anything offered, making a rate based on past experience on similar classes of property, and would then trust largely to chance. In those days, fire hazards were comparatively few, while fire-detecting and fire-fighting appliances were comparatively simple. The latter consisted mainly of buckets, augumented in the cities and larger towns by public "hand-tubs," hose and ladders.

As manufacturing plants became larger, and as processes became more varied and complicated, fires were more frequent and of greater severity. In consequence the rates had to be raised, in order that the insurance companies might do business at a profit. No adequate steps were taken by the underwriters to reduce the fire loss; and, as a result, the rates finally became so high that manufacturers demurred, and sought methods of insuring themselves. Thus was formed, about the middle of the century, the Factory Mutual Insurance System, inaugurated by the cotton and woollen mills, but since extended to cover numerous classes of business. In fairness to the others, it was necessary that no mill be taken into the system that was not up to the average standard in regard to fire protection and the proper arrangement of the hazards. Therefore, an inspec-

tion department became necessary, the duties of which were: first, to report on the condition of mills desiring to be taken into the system, and, second, by frequent inspection of the plants already insured, to keep in touch with any possible changes and to improve the plants as fire risks by making suggestions for lessening the hazards and for bettering the fire protection. This was perhaps the beginning of Insurance Engineering. The stock companies soon found that they, too, must form inspection departments, for the purpose partly of competing with the Mutual Companies and partly of improving the plants from a fire insurance standpoint, thus reducing their fire loss. The more progressive underwriters began also to appreciate the necessity of having an accurate report on a factory before undertaking to insure it.

The growth of expert inspection was greatly stimulated by the use of interior fire-extinguishing devices, which began to assume some importance about 1875. These required scientific supervision for their proper installation and maintenance. A brief account of the development of these devices is necessary for a full understanding of the subject, for the growth of Fire Insurance Engineering is very closely related to it.

Formerly the only interior fire protection in manufacturing plants was that afforded by pails or buckets. Next came the standpipe, usually of cast iron, about four inches in diameter, located inside or just outside the wall, and with hose connections on each floor. It was usually supplied by private fire pumps, but sometimes by public water. About 1870 the system of perforated pipes began to be used in extra hazardous places, such as the picker-rooms of cotton-mills. These pipes were of iron, three-quarters of an inch, and larger, in diameter, with small holes drilled about a foot apart near the upper side. They were attached to the ceiling, about ten feet apart, and were connected to a supply pipe running to a yard main. Each floor had its separate riser; and the water was controlled by a valve, located outside the building, which could be opened in case of fire. This crude system had two impor-

tant defects,— that of wetting down a larger area than was in most cases necessary and that of unreliability due to clogging of the perforations by rust and sediment.

This system was superseded in a few years by the automatic sprinkler, a device for automatically distributing water where it is needed in case of fire. The modern sprinkler consists, in brief, of a brass casting containing an outlet about half an inch in diameter, normally closed by a movable disc kept in place by a strut or by levers which are held together with soft solder. These sprinklers are attached to pipes somewhat similar in their arrangement to the old perforated pipes. When a temperature of 165° Fahrenheit is reached, the solder fuses and the sprinkler opens and distributes water which is at all times in the pipes under pressure. This system was wonderfully successful from the very start, but, of course, has since undergone a great development, and at present has reached a degree of perfection where little remains to be desired. To-day a large majority of the manufacturing plants in the country are equipped with automatic sprinklers. Nor is the use of sprinklers confined to manufacturing plants alone, as they are extensively used in storehouses, department stores, and mercantile buildings. Such systems are now often complicated by the introduction of dry valves,— which allow the use of sprinklers in unheated buildings,— by alarm valves, and other devices. The record of the automatic sprinkler has certainly been a remarkable one ; and but few fires have gained any considerable headway in buildings properly equipped with this device. The value put upon the device by the insurance companies — which should be a fair estimate of its worth — is shown by the reduction in rate, often exceeding 50 per cent., allowed for its introduction.

The growth of the automatic sprinkler has perhaps been the most important single factor in the recent development of fire protection devices, though there are several other devices of importance which should be mentioned.

The steam fire pump has during the same time been developed from the old single-acting type, with a capacity of

not over 500 or 600 gallons per minute, to the modern underwriter duplex pump, of 750 to 1,000 and even 1,500 gallons per minute capacity ; and the rotary or power-driven pump has been greatly improved. For the underwriter pump specifications, underwriters are largely indebted to Mr. John R. Freeman, of the class of 1876, M. I. T., one of the ablest fire insurance engineers of the day.

Mill yard hydrants were formerly simple standpipes with two outlets at the top, each controlled by a valve. Yard piping had, therefore, to be drained in winter, to prevent the freezing of the hydrants. The delay of getting water from a hydrant in cold weather was a serious matter. These hydrants have been replaced by the modern frost-proof mill yard hydrant, with a valve below frost line, with an independent outside valve on each of the hose connections, and with numerous minor improvements.

Fire hose, chemical extinguishers, fire doors and shutters, have also undergone radical improvements during the same period.

In the field of fire-detecting devices the automatic thermostat has been developed to a high state of perfection. The modern thermostat is of the solder release type, simple and certain in its action. When the thermostat fuses, an electrical connection is made between two wires, and this rings an alarm either directly or through a transmitting device. As now installed in large cities, the wires all converge to a central station, and in case of fire the box number of the building, together with the floor number, are automatically registered on a tape and sounded on a gong.

This is perhaps sufficient to give an idea of the growth of fire-protecting devices during the last thirty years. As new devices were introduced, it became necessary for the underwriters to investigate them thoroughly, and by careful tests to ascertain their practical value. Moreover, where devices were found defective, it was to their interest to suggest improvements, and thus to assist the inventor and manufacturer in their perfection. Thus was developed a subject that could not be handled by the insurance man of ordinary training, but which required the services of

scientific experts such as were found in the engineering and inspecting department. As a direct consequence of this development, there fell to the Insurance Engineer the duty of supervising the introduction of these devices and of drawing up rules to govern their installation. Neither the property owner nor the contractor could be relied upon to do this properly. The one was not sufficiently versed in the subject to understand the importance of the minor details, and the other was usually more interested in completing his contract at a profit than in giving the best possible protection. Thus it is evident that sprinklers are of little value, if not properly spaced and located so that each shall cover its allotted area. They must neither be so high as to have the distribution obstructed by the ceiling timbers, nor so low as not to wet the ceiling properly or to fail to operate promptly. Supply pipes of sufficient size, and water supplies of adequate volume and pressure, are essential. Steam pumps are of little value, unless properly connected to their steam and water supplies and unless so located as to minimize the danger of being crippled in case of fire. Automatic thermostats are of little value unless properly located and with a reliable device for transmitting the alarm after the thermostat itself has operated.

Equally important with the correct installation of these devices is their proper maintenance. While the factory manager may be a thorough believer in protective devices and may make a conscientious effort to keep them in good order, still it is a fact that such devices will get out of order in the average plant unless regularly and carefully inspected. Partitions, shelves, and racks will be built so as to obstruct the distribution of sprinklers; tanks and pails intended for fire purposes only will become empty; electric batteries will get out of order; pumps will become worn and clogged,— even with good management. It is astonishing how many gate valves supplying sprinkler systems will be found closed in the course of a year's inspections, in most cases through carelessness alone. Additions will be built; and, through ignorance or neglect, the proper fire protection will be omitted.

In many of the larger and better managed plants a systematic inspection is now being undertaken by the owners. A reliable man is detailed to make a weekly inspection of valves, tanks, pumps, pails, hose, fire doors, shutters, alarm systems, etc., and to report the condition of the same on a printed blank. This is proving of great value, and may in time be so developed as to relieve the insurance companies of a part of their work in this line. At present, however, it is the insurance inspectors who are doing this work; and it is they who always must do at least a part of it.

As processes become more complex and varied, so the fire hazards increase. One of the important duties of the Fire Insurance Engineer is to investigate the causes of fires and to study the processes that are likely to cause them. There has certainly been much to occupy the attention of the insurance expert in the line of new and hazardous processes during the last quarter of a century. Take the single case of celluloid as an example. Celluloid was scarcely known in 1875, but to-day it is being manufactured in enormous quantities and used for innumerable purposes. Its manufacture may be compared with gunpowder in danger. In fact, the cellulose at one stage of the processes is very close to gun cotton in chemical composition; and great care has to be exercised that gun cotton is not formed by mistake. In the early days its manufacture was so hazardous that 8 per cent. of the capital invested, it has been estimated, was destroyed by fire during the years 1884 and 1885. Still, the manufacturer asked for insurance; and it became the duty of the Insurance Engineer to assist him in reducing the hazards and in arranging the work so that the most dangerous processes should be safely located.

The recent developments in the sciences of heating and lighting also called forth careful investigation and study on the part of the insurance experts. In the early days of electric lighting, very unsafe equipments were installed and many fires resulted. While the improvements that were naturally introduced as the subject was developed tended, as a rule, toward greater safety, still the interests of the

electrical manufacturers and dealers were often found to lie in other directions than those of greatest safety. It became necessary, therefore, for the insurance interests to formulate rules for electrical installations in which safety was the primary object. As a result, electricity is now considered as the safest of all illuminants, and fires caused by properly installed equipments are very few.

The most recent problems in lighting have been occasioned by the introduction of gasolene and acetylene gas. Here, again, careful supervision was needed by the insurance interests; and exhaustive tests were made on all machines put on the market before being approved by the underwriters.

In general, it may be said that the interests of the manufacturers and dealers are, primarily, cheapness and efficiency, and, secondarily, safety; while those of the underwriter are primarily, safety, and, secondarily, cheapness and efficiency. Fortunately, the latter has considerable power through the medium of rates, and, as a rule, only the safety devices find a permanent market.

The matter of building construction is of vital interest to underwriters, and much engineering thought has been given by them to the designing of the modern standard slow-burning mill as well as to the numerous forms of fireproof construction.

The requirements of a Fire Insurance Engineer may be stated briefly, as follows: —

First: He should have training in hydraulic engineering. Water is the world's greatest fire destroyer; and to arrange for its economical transportation and distribution with the aid of all the modern devices, so that it may be obtained, where needed, at an instant's notice, is perhaps the most important duty of the Insurance Engineer.

Second: He should have training in mechanical engineering. Numerous complicated devices for fire protection are continually being put on the market. These he should be able to understand thoroughly, to find their defects, and to suggest modifications and improvements in them. He should also be able to become quickly familiar with ma-

chines used in manufacturing,—above all, those that involve any fire hazard. Some knowledge of steam engineering is of great value, especially in pump work. Experience in draughting is also necessary in plan work, which is an important department of Insurance Engineering.

Third: He should be well grounded in chemistry and able carefully to investigate all chemical processes and compounds that are in the least hazardous in their nature.

Fourth: He should be an Electrical Engineer, or have enough electrical knowledge to be able to follow the modern development of electricity for power, light, and the transmission of signals.

Finally: This being one of the youngest branches of engineering, many problems remain undiscovered and unsolved; and the Insurance Engineer should possess that originality which, combined with a thorough scientific training, will enable him to cope successfully with new problems as they arise.

No article on fire insurance engineering would be complete without some mention of the three prominent engineering laboratories,— the testing house of the British Fire Prevention Committee, the Chicago Underwriters' Laboratories, and the Boston Insurance Engineering Experimental Station.

The British Fire Prevention Committee is a society composed of English architects and underwriters. Its headquarters are in London, and it has a testing station in the suburbs of that city. Here tests are made on different forms of fire-proof construction, fire-retarding glass, partitions, doors, fire-resisting curtains, fire-proof wood, etc. The samples to be tested are placed in small brick test-houses, and heat is applied by gas generated on the grounds.

The Underwriters' Laboratories are located on Twenty-first Street, Chicago, and are supported largely by the National Board of Underwriters. Here are tested all kinds of fire-extinguishing devices, including automatic sprinklers, dry valves, alarm valves, chemical extinguishers; fire retardents, such as paints, wire glass, fire doors, etc.; all kinds of gasolene and acetylene lighting machines; electrical devices, including switches, cut-outs, wire, etc.

The Laboratories and the National Fire Protection Association are closely allied. To this association has been delegated by the National Board of Underwriters the power to test and approve devices used in fire protection work, and to draw up rules for their installation. This subject is in charge of a committee, and all testing for it is done at the laboratories.

The National Fire Protection Association is an organization of fire insurance engineers connected with stock companies throughout the United States and Canada. The active membership consists of thirty-four boards and bureaus, having to do with improving fire protection in insured buildings; and the associate membership includes about one hundred and twenty individuals engaged in fire insurance. The objects of the association, to quote from the articles of association, are "to promote the science and improve the methods of fire protection; to obtain and circulate information on this subject; and to secure co-operation in matters of common interest." The association holds annual meetings, at which subjects of interest to insurance engineers are discussed by papers or through committee reports, and rules are drawn up for promulgation by the National Board.

At the Laboratories is a corps of engineers, under the supervision of the secretary, Mr. W. H. Merrill, Jr., of the class of 1889, M. I. T. The tests carried on here are conducted with the greatest accuracy and thoroughness. The work of these Laboratories is undoubtedly the most extensive and important of its kind in the world.

The Boston Engineering Experiment Station was established by Edward Atkinson, president of the Boston Manufacturers' Mutual Insurance Company, last spring. It is supported largely by contributions — on the basis of one cent for every $100 insurance carried — from over two hundred manufacturing corporations and firms insuring with the Associated Factory Mutuals. At present the work is carried on at the Massachusetts Institute of Technology, and is in charge of Professor Charles L. Norton. The subjects already taken up are: 1. Tests of Fire-proof

Wood, so called; 2. Sound-proof Partitions; 3. Wired Glass and Diffusion of Light; 4. Corrosion of Steel. A report on Slow-burning Construction is under way.

It is Mr. Atkinson's plan to build in some isolated spot near Boston a testing station to be used for testing different types of fire-proof construction and for studying cements, mortars, and concretes. He also plans to block out a complete course of instruction in Insurance Engineering, and then, if possible, to transfer the plant and experience derived to the Massachusetts Institute of Technology as the foundation of a department.

In conclusion, it may be interesting to note the growth of Fire Insurance Engineering during the last ten years as shown in the Institute Catalogue. In 1890 there were five graduates engaged in this branch of engineering. In 1901 there were over twenty. It is a branch of engineering as yet almost in its infancy, and one that offers a wide and attractive field to the graduates of a scientific institute. The Fire Insurance Engineer is constantly stimulated by the thought that, although he is not directly adding to the world's wealth, he is indirectly doing so by reducing the fearful fire waste which now annually destroys nearly $150,000,000 worth of property in this country alone.

GORHAM DANA, '92.

THE INSTITUTE AND THE COMMONWEALTH

The memorial presented to the legislature of Massachusetts this year by the Institute, asking the Commonwealth to convey to it the fee simple of the land occupied by the Rogers and Walker Buildings makes it an especially appropriate time to consider and review the relations of the Commonwealth to the Institute.

The authority of the legislature to give aid to the Institute or to exercise power in any direction is found in the constitution of the Commonwealth. There the extent and limitation of the authority delegated to the legislature by the people is defined. The most important powers are the right to tax and the right to take property by eminent domain. The power to give aid to an educational institution is dependent on the former. These powers are both limited by the provision that they can be exercised only for a public use or purpose. The courts have held that aid to a private manufacturing enterprise is not for a public purpose, also that aid by way of loans to individuals for rebuilding the burned district of Boston is not for a public purpose; although in both cases the general welfare is promoted indirectly.* The court in the last case said, "The essential point is that it affects them as a community, and not merely as individuals." There must be a direct relation between the primary object of an appropriation and the public enjoyment.

Aid to educational institutions meets these requirements and, therefore, is for a public use or purpose within the meaning of the constitution. When our constitution was adopted in 1780, the members of the convention were alive to the value of education in the Commonwealth. James Bowdoin, the president of the convention, afterwards governor, was a member of the corporation of Harvard University; and it was not left as a matter of infer-

* *Lowell* v. *Boston*, 111 Mass. 454.

ence, but was explicitly stated, not only that the legislature had the power to aid educational institutions, but that it was its positive *duty* to aid them.

Three articles of Chapter V. of the Constitution are devoted to Harvard University. There it is stated, "The encouragement of arts and sciences and all good literature tends to the honor of God, the advantage of the Christian religion, and the great benefit of this and the other United States of America." Chapter V., Section II., of the Constitution reads as follows: —

THE ENCOURAGEMENT OF LITERATURE, ETC.

Wisdom and knowledge, as well as virtue, diffused generally among the body of the people, being necessary for the preservation of their rights and liberties; and as these depend on spreading the opportunities and advantages of education in the various parts of the country, and among the different orders of the people, *it shall be the duty of legislatures and magistrates, in all future periods of this commonwealth, to cherish the interest of literature and the sciences, and all seminaries of them;* especially the university at Cambridge, public schools and grammar schools in the towns; *to encourage private societies and public institutions, rewards and immunities, for the promotion of agriculture, arts, sciences, commerce, trades, manufactures,* and a natural history of the country; to countenance and inculcate the principles of humanity and general benevolence, public and private charity, industry and frugality, honesty and punctuality in their dealings; sincerity, good humor, and all social affections, and generous sentiments among the people.

Aid to the Institute is constitutional, primarily because it is an educational institution, but also on the ground that the Institute is of direct general value in promoting the industries of the Commonwealth. It was on this ground that the act establishing textile schools * was upheld. The court said, "It is in aid of manufactures which the constitution enjoins the legislature to encourage." † The right to give aid to the "common or public schools" is limited by Article XVIII. of the Amendments to the Con-

* Statutes of 1895, chap. 475. † *Hanscom* v. *City of Lowell*, 165 Mass. 419.

stitution, which was adopted in 1855. This provides that the State may appropriate money for no other schools than those "under the order and superintendence of the authorities of the town or city in which the money is to be expended," and that "such money shall never be appropriated to any religious sect for the maintenance exclusively of its own school." * It has been held that this article of the Constitution does not apply to colleges.† There is then no doubt of the constitutional power of the legislature to give aid to the Institute by way of a grant of either land or money.

State aid to colleges has been the policy of the Commonwealth and nation ever since the General Court of Massachusetts Bay in 1636 voted to "give £400 towards a school or college." This amounted to a tax of fifty cents per capita. From that day, whenever Harvard has needed aid from the State, she has received it,—in all about $216,000 besides the ferry rights between Charlestown and Boston, and certain lands. For many years money was appropriated annually by the General Court for buildings and salaries. These appropriations represent the equivalent of many times that amount to-day.‡

Part of the value of every pound of tobacco raised in Virginia went into the treasury of William and Mary College, the second college founded in the colonies.

Jefferson, individualist that he was, saw nothing inconsistent with his theories in State aid to education,—in fact, it was an essential part of the theory of individualism that the individual should be well educated. When he founded the University of Virginia, in 1818, he endeavored to make it a part of the State system of education ; and it has always received State aid.

As late as 1863 Yale College received $135,000 from Connecticut, and during the whole of the eighteenth century it was supported by the bounty of the State.

New Hampshire annually appropriates money for Dart-

* *Jenkins* v. *Andover*, 103 Mass. 94; see also *Cushing* v. *Newburyport*, 10 Metcalf, 508.

† *Merrick* v. *Amherst*, 12 Allen, 500.

‡ See "Sketch of History of Harvard College," by Samuel A. Eliot.

mouth College; buildings to the cost of $135,000 have been erected on its campus by the State; and earlier in its history the State of Vermont, recognizing the importance of the college to Vermont, granted it a township, as did also New Hampshire.

The act incorporating Williams College in 1793 provided for an annual appropriation of $15,000 for four years. It has received $143,500 in all from the State.

Bowdoin College, founded in 1794, received from Massachusetts in land and money $52,000 before the separation in 1820. Provision was made for Bowdoin in the act of separation, in accordance with which she has received aid from the State of Maine. Only this year Maine has made gifts to her colleges.

The last three colleges received a portion of the sums named from the Massachusetts bank tax, which it was voted to distribute among them in 1813.*

Worcester Polytechnic Institute has received $233,000, including scholarships; Tufts, $50,000; Amherst, $27,500; Wesleyan Academy, $47,298; and Mt. Holyoke, $40,000. Williams, Tufts, Amherst, and Wesleyan were beneficiaries, with the Massachusetts School Fund, under the Back Bay lands act of 1859.† The Massachusetts Agricultural College has received $1,278,307.63, including scholarships and the income from the fund established by the Morrill Act, in addition to $587,157.67 for its Agricultural Experiment Station, commercial feed-stuffs, Veterinary Laboratory, and Museum of Zoölogy.‡

In the South and West a system of state universities has grown up, and the annual state appropriations for these universities often exceed the total sum which the Institute has received from the State. Only last year the State of Michigan appropriated $450,000, while Wisconsin, Illinois, and California gave even larger sums. There are now thirty such universities, the list beginning with the University of Pennsylvania in 1755, and ending with the University of Montana in 1884.

* Acts of 1813, chap. 150. † Acts of 1859, chap. 154.

‡ See House Document No. 134, 1891.

Having now shown that State aid to educational institutions is constitutional, and that it is the established policy both of the nation and the Commonwealth to give aid to such institutions when the gifts of individuals do not keep pace with their growing usefulness and needs, let us now consider more specifically the policy of the Commonwealth toward the Institute.

President Walker, addressing the legislature on one occasion, stated that he recognized the Commonwealth of Massachusetts as the founder of the Institute.* This certainly is not true in the sense that the Commonwealth is the founder of Harvard University, although there is some ground for the statement. The beginnings of many universities in Europe are mythological, but those of the Institute are not. The real founder of the Institute was its first president, William Barton Rogers. Credit must also be given, however, to Professor Rogers' associates, in particular to his brother Henry for his suggestive helpfulness; to Dr. William J. Walker and Ralph Huntington, for their liberality at a critical juncture; to John Amory Lowell, then the trustee of the Lowell Institute, for his intelligent and helpful interest; to Governor John A. Andrew, for his kindness and solicitude; and to many others who did silent and effective work. The policy of the Commonwealth in filling up and improving the Back Bay, and the actual needs which our industries felt for greater technical skill and a more highly trained intelligence, were also great contributory causes.

In his numerous sojourns in Boston, when he lectured at the Lowell Institute or visited his brother Henry at Harvard, William B. Rogers became very much impressed with "the knowledge-seeking spirit and intellectual capabilities of the community in and around Boston," and in answer to a letter from his brother Henry in regard to the matter, said: "I have felt persuaded that of all places in the world it [Boston] was the one most certain to derive the highest benefits from a Polytechnic Institute. The occupations and interests of the great mass of the people

* Petition accompanying the bill which became Statutes of 1887, chap. 103.

are immediately connected with the applications of physical science, and their quick intelligence has already impressed them with just ideas of the value of scientific teaching in their daily pursuits." * He then proceeded to draw up a plan for a polytechnic school in Boston.† This was in 1846. The next year he wrote to his brother Henry, saying: "Would it not be well, as occasion offers, to sound some of the leading practical men in Boston on the subject of our scheme? I confidently think that, after taking time to digest courses of lectures on practical subjects, we might even a year hence command immense classes from the ranks of mechanics, manufacturers, and part of the merchants of the city." ‡

A letter from his brother Henry in 1849 shows their view of the need of the times in education. "I think," he says, "the time is nearly at hand for an important revolution in this whole matter of collegiate education. The old institutions with their vast funds educating youth at enormous expense, yet fitting them for nothing truly useful or calculated to advance the age, must soon meet the rivalry of institutions which will embody modern ideas." §

In 1849 Professor Rogers married Miss Emma Savage, of Boston; and four years later family affairs and the desire to complete and publish his final report on the geological survey of Virginia led him to resign his professorship in the University of Virginia, and to take up his residence in Boston.

Professor Rogers was already well known, and soon became an integral part of the community whose "intellectual capabilities" he had long admired. As business revived after the financial depression of 1857, he began to interest business men and educators in his project. His experience with the legislature of Virginia had prepared him for his campaign with the Massachusetts legislature, which was soon to begin. To obtain support from the State of Vir-

* Letter dated University of Virginia, March 13, 1846, "Life and Letters of William Barton Rogers" edited by his wife, with the assistance of Professor William T. Sedgwick, vol. i. p. 259.

† Appendix C, "Life and Letters," vol. i.

‡ "Life and Letters," vol. i. p. 277. § *Ibid.*, p. 311.

ginia for the geological survey had been a continual struggle; and in 1845, when it was threatened to withdraw the State annuity of $15,000 from the University of Virginia, it devolved upon him, as chairman of the faculty, to make its defence. He had been allowed then to address the members from the floor of the House of Delegates, and by direct contact to influence each member. This had been very effective, as he was one of the most eloquent and magnetic men of his time. This privilege was not accorded to him in Massachusetts, and he had to depend more upon other methods for influencing the legislature.

The address of Governor Nathaniel P. Banks, in 1859, had recommended the use of a portion of the Back Bay land for educational purposes. Following this suggestion, representatives, to the number of forty, of the Boston Society of Natural History, the Horticultural Society, and other associations of art, science, commerce, and manufactures, met in the library of the Society of Natural History on Mason Street, and appointed a committee of seven to memorialize the legislature for "a reservation of State land in the Back Bay for a conservatory of arts and science." This scheme involved the grouping of all the societies in buildings erected in close proximity, each with its museum. Professor Rogers was a member of the committee, but was not active, as he was away on a lecturing tour in Virginia. The legislature of 1859 refused the grant; and the next year another petition was presented, written by Professor Rogers, containing this time a proposal in regard to a school of industrial science. The memorialists looked forward to a time when the museums would be augmented by the establishment of a "comprehensive polytechnic college, which, like the Central School of Arts and Manufactures of Paris, or the great Trades Institute of Berlin," would put in practice a complete system of industrial education.* This bill passed the House, but failed to pass the Senate.

Defeated a second time, the committee of "Associated Institutions" appointed a sub-committee, consisting of

* "Life and Letters," vol. ii., Appendix A.

William B. Rogers, chairman, E. B. Bigelow, J. M. Beebe, M. D. Ross, and Charles H. Dalton, "to prepare and report the plan of an industrial institution designed for the advancement of the industrial arts and sciences and practical education in the Commonwealth." Professor Rogers spent the summer in preparing a pamphlet outlining the "Objects and Plan of an Institute of Technology," which was accepted by the committee and read and approved at a public meeting held in the rooms of the Board of Trade, Oct. 5, 1860. The pamphlet was distributed widely among the influential citizens of the city and State, accompanied by a circular letter, signed by Professor Rogers, asking those who favored the plan to allow the use and influence of their names. The response showed that the scheme had the hearty approval of the community at large; and, later, invitations to a meeting to be held on Jan. 11, 1861, in Mercantile Hall, 16 Summer Street, were sent to those who had received the "Objects and Plan."

This meeting was called to order by Mr. S. H. Gookin, who introduced Professor Rogers as chairman. The late Professor John D. Runkle was chosen secretary. Addresses were made by Professor Rogers, Mr. C. A. Browne, Professor Peirce of Cambridge, Rev. E. S. Gannett, and others. A preliminary organization was effected, comprising over two hundred members; and resolutions were passed providing for the appointment of a committee of twenty-one to represent the association until it should be legally incorporated. The committee was authorized to frame a constitution and by-laws, and to co-operate with the committee of "Associated Institutions" in obtaining from the legislature a charter and a grant of land in the Back Bay.

A third memorial was presented, and referred to the Committee on Education. Professor Rogers and others advocated the bill at the various hearings, and corresponded with persons of influence throughout the State. The principal opposition was from the secretary of the Board of Education and other friends of the School Fund which, by legislation in 1859,* was to benefit by the sale of the Back Bay

* Acts of 1859, chap. 154.

lands, and might conceivably be injured by a gift of any portion of these as contemplated in the act proposed. Professor Rogers argued that the benefits which the Commonwealth would receive from the proposed Institute were so great that she could afford to reimburse the School Fund if it should be diminished as a result of the grant, but that, as a matter of fact, it would not be diminished because the establishment of the Institute and Society of Natural History would greatly enhance the value of the Back Bay lands.

In a letter to his brother Henry, dated Feb. 18, 1861, Professor Rogers wrote, "The public mind here is in advance of the legislature in this matter." * This supports the proposition laid down by Professor Dicey of Oxford, that legislatures are generally about thirty years behind public opinion. However, through the generalship of Professor Rogers, public opinion had now been organized and brought to bear on the legislature. He himself had turned — in a good sense — lobbyist, and had personally explained his plan to many of the members.

It was characteristic of the energy and thoroughness of Professor Rogers that he should write the Report of the Committee on Education, recommending the legislation for which he asked. In his dealings with the legislature of Virginia, he had done this several times, his report for the committee which considered the question of withdrawing the State annuity from the University of Virginia being especially noteworthy, as it outlined the requirements for State aid to colleges in a most convincing way.†

The legislature of 1861 came at last to appreciate the value of the proposed institute to the industries of the State, as the following extracts from the Report of the Committee on Education show: —

> As regards the public benefits to be anticipated from it the memorialists represent that such an institution, in its threefold character of a Society of Arts, a Museum of Arts, and a School of Industrial Science, would be largely conducive to the progress of

* "Life and Letters," vol. ii. p. 69. † *Ibid.*, vol. i. Appendix A.

the industrial arts and sciences throughout the Commonwealth, and, while thus adding to the material wealth of the State, would form a supplement to our educational system of great importance in its influence upon the intelligence and morality of the community, and especially of the industrial classes.

They urge that, in the existing competitions of manufacturing, commercial, and agricultural pursuits, such a special training in practical science has become indispensable, if we would hope to maintain a prosperous career amid the busy enterprises and inventions of the leading European nations.

They cite, in favor of the plan, the example of England, France, and other States eminent for their progress in industry and applied science, and argue, from the general spread of elementary knowledge among ourselves and from the peculiarly practical genius of our people, that we are most favorably placed for reaping the advantages of such an institution, and for drawing the richest profits from its teachings as applied in the fields of commerce and the arts. . . .

In this connection they dwell particularly on the fact that the Institute will fill an important gap in the present educational plans of the Commonwealth, by supplying the industrial classes with the knowledge and training of which they are specially in need, and which could not be effectually provided in any of the existing institutions of the State.

The State Board of Education failed to uphold its secretary in his opposition; and the bill was passed, Governor Andrew signing it on April 10, 1861.*

In this act, William B. Rogers, James M. Beebe, E. S. Tobey, S. H. Gookin, E. B. Bigelow, M. D. Ross, J. D. Philbrick, F. H. Storer, J. D. Runkle, C. H. Dalton, J. B. Francis, J. C. Hoadley, M. P. Wilder, C. L. Flint, Thomas Rice, John Chase, J. P. Robinson, F. W. Lincoln, Jr., Thomas Aspinwall, J. A. Dupee, and E. C. Cabot were named; and they and their associates and successors were made "a body corporate by the name of the Massachusetts Institute of Technology."

The specific purpose of the corporation, as stated, was to institute and maintain (1) "a society of arts, (2) a museum of arts, and (3) a school of industrial science." The gen-

* Acts of 1861, chap. 183.

eral purpose was to aid "by suitable means the advancement, development, and practical application of science in connection with arts, agriculture, manufactures, and commerce."

Section 3 provided that the second square westwardly from the Public Garden, between Newbury and Boylston Streets, should "be reserved from sale forever, and kept as an open space, *or* for the use of such educational institutions of science and art as are hereinafter provided for."

Section 4 provided that, if evidence of organization should be filed with the governor and council within one year, and also evidence that funds had been "subscribed or otherwise guaranteed for the prosecution of its objects to an amount at least of one hundred thousand dollars," the Institute should be entitled "to a perpetual right to hold, occupy, and control," for the purposes mentioned, the westerly portion of the square above described "to the extent of two-thirds part thereof, free of rent or charge by the Commonwealth."

There were other conditions, as follows: persons from all parts of the Commonwealth alike to be eligible as members of the Institute or as pupils; the museum to be open to the public under reasonable regulations; a suitable building to be completed and grounds to be appropriately adorned within two years from the time the land is placed at the disposal of the Institute, filled and graded; grounds and building always to be kept in a sightly condition; all buildings on said square and the grounds about them to be maintained in a manner satisfactory to the governor and council; and last, and most important at the present time, said square or any portion thereof never to be appropriated for "any purpose or use foreign to its legitimate objects." If at any time these conditions are broken, the rights of the Institute in the square are forfeited; and the Commonwealth, after due notice, may enter and take possession.

This act gives the use of the easterly third, with the right to build on one-third of it, to the Boston Society of Natural History on the same conditions.

The fact that the Commonwealth would be recompensed

for its gift by the rise in the value of the adjoining land due to the occupation by these societies is recognized in the provision that the lots fronting on the square on Boylston, Clarendon, and Newbury Streets, should not be sold until after the square had been improved by the two societies; and that then, if they did not sell for more than their original value plus the appraised value of the square at the time of the passage of the act, the two societies should pay the difference to the Commonwealth. This "ungracious condition," as Professor Rogers called it, was subsequently repealed.*

The Institute was empowered to hold real and personal estate to an amount not exceeding two hundred thousand dollars. By subsequent acts this limit has been raised, so that now the Institute may hold real and personal property the clear income of which is not more than one hundred thousand dollars.†

Under the general corporation law,‡ authority was given to sue and be sued, and to convey lands of which it held the legal title, to have a common seal, and to make rules and regulations for its government.

The property of the Institute was exempted from taxation, under the general tax law § which provided that the real and personal property of "literary, benevolent, charitable, and scientific institutions incorporated within this Commonwealth," occupied and used "for the purposes for which they were incorporated," shall be exempted from taxation.

The act was passed only three days before the attack on Fort Sumter, and, owing to the distractions of the war which followed, little attention could be given to the Institute; but on April 8, 1862, a meeting was held in the rooms of the Board of Trade, and the Institute was formally organized under its charter.

Hon. F. W. Lincoln presided, and John D. Runkle acted as secretary. Professor Rogers presented the by-laws, which were adopted; and the officers were chosen in

* Acts of 1863, chap. 226.
† Acts of 1865, chap. 220; Acts of 1888, chap. 72.
‡ Gen. Statutes, chap. 68.
§ *Ibid.*, chap. 11.

conformity therewith. President Rogers in his inaugural address said that they were pledged to "a great scheme of practical education and industrial improvement," and that, "should they succeed as present indications assured them they would, they might well claim the enduring thanks of the State and of the friends of progress everywhere." It is needless to say that his highest expectations have been more than realized.

At the expiration of the year the $100,000 upon which the State's gift was conditioned had not been raised; and the legislature was asked to extend the time one year, which it did.*

The last month of the second year found the outlook very little improved. The war had unsettled the business world, and gifts for this purpose were not numerous. Many friends of the Institute were also friends of the Boston Society of Natural History, which had already begun to erect its building, and needed their financial assistance. Upon the very last day a letter came announcing a gift from Dr. William J. Walker of not less than $60,000, and in this almost dramatic way the expiring charter was saved.

The first work of the Institute was through the Society of Arts, which held its first meeting, Dec. 17, 1862, in the Mercantile Building, Summer Street. The spirit of the times is reflected in the papers read on that occasion by R. B. Forbes, on "Sub-aqueous Gun-firing" and on "The Combination of Wood and Iron in Ship-building," and by E. S. Ritchie, on his own "Improvements in the Construction of Ship and Boat Compasses." These meetings have continued ever since, with increasing value to the community.

July 2, 1862, Congress passed the so-called Morrill Act, which assigned to each State accepting the act within five years 30,000 acres of public land for each senator and representative, the proceeds from the sale of the same to be set aside as a permanent fund, and the income to be used to support one or more colleges of agriculture or the

*Acts of 1862, chap. 142.

mechanic arts. The Massachusetts Fund amounted eventually to over $200,000. The whole sum realized from the nation's gift to education was $7,545,405. Senator Justin S. Morrill, Dr. Amos Brown, of New York, and Dr. Ivan Pugh, of Pennsylvania, deserve the chief credit for this legislation, which has contributed not a little to the nation's intellectual and material growth. By act of Congress, Aug. 30, 1890, $15,000 a year was appropriated for each State "for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established or which may be hereafter established in accordance with an act of Congress approved July 2, 1862"; and it was provided that this should be increased by $1,000 a year until it amounted to $25,000. The policy of setting aside the proceeds of the sale of public lands may be traced to a provision in the Ordinance of 1787, put in by Dr. Manasseh Cutler, which provided that a certain portion of the public land should be applied to purposes of education.

Governor Andrew, in his annual address in 1863, suggested a union of the Bussey Institute and our Institute as the Morrill Act College; but President Rogers, then as always, was determined to avoid "entangling alliances," and insisted on working out this new experiment in education in complete independence and unity of government.

The legislature of Massachusetts passed an act accepting the Morrill Act, April 27, 1863.* The Institute was designated as the College of Mechanic Arts, to receive one-third of the income from the fund. The other two-thirds were given to the Massachusetts Agricultural College.

By the terms of the act the Commonwealth was given a representation in the government of the Institute in the persons of the governor, the chief justice of the Supreme Judicial Court, and the secretary of the State Board of Education, *ex officiis*. The Institute was obliged to provide instruction in military tactics,† and was required to furnish

* Acts of 1863, chap. 186.

† By the Acts of 1867, chap. 6, and Acts of 1880, chap. 21, the Commonwealth issued arms and equipment to the Institute.

the governor and council with its annual report. If at any time the Institute ceased to be maintained for the purposes provided in the act of incorporation, the aid was to be withheld.

These conditions did not mean State control or interference with the administration of the Institute, and, therefore, were not offensive to President Rogers. The act was accepted by the Institute June 30, 1863.

At a meeting held May 6, 1863, a committee was chosen to erect a building. Mr. William Gibbons Preston was the architect.

On May 30, 1864, President Rogers submitted his scheme of instruction, entitled "The Scope and Plan of the School of Industrial Science of the Massachusetts Institute of Technology," which was adopted. Professor Runkle has fittingly described it as the "intellectual charter" of the Institute.

A preliminary session of the School of Industrial Science was opened in February, 1865, in leased rooms of the Mercantile Library Association on Summer Street and in the dwelling of Judge Jackson on Rowe Place. Regular courses opened in October of the same year. The number of students registered the first year was seventy-two; there were ten professors and instructors.

In the fall of 1866 the Institute moved into its new building, named in 1882 the Rogers Building; and in 1868 was graduated the first class of fourteen men.*

All the conditions upon which the Commonwealth's first gift to the Institute depended had now been fulfilled. The Institute will always be grateful for this initial mark of favor; but it must be remembered that this gift, far from costing the Commonwealth anything, was a source of direct pecuniary profit to the State.

The so-called "ungracious conditions" in the act (see page 167) show conclusively that the gift to the Institute and the Society of Natural History was a financial measure adopted by the Commonwealth to accelerate the lagging sale of land on the Back Bay. It had taken two years to

*By the Acts of 1868, chap. 247, the Institute had been empowered to give degrees.

sell the square bounded by Boylston, Berkeley, Newbury, and Arlington Streets. This square was more desirable than the Institute Square and its surrounding lots, but it sold for only $1.16⅔ a foot. The Institute could have bought the lot in fee simple at that time, with the right to build on the entire lot instead of on one-third of it, for $103,000, which was the value set upon it by the official appraiser. There were 87,680 square feet in the Institute's two-thirds, so that the appraised value represents a cost per foot greater than was paid for the square above referred to.

The Institute erected, at a much greater cost than they could then afford, but which subsequent developments have fully justified, a beautiful building, the incentive for other beautiful buildings on Copley Square and the neighboring streets. An eminent French architect has pronounced it the finest building in Boston. The effect of this was: first, to accelerate the sale of the neighboring lots; and, secondly, greatly to increase the amount which the Commonwealth received for them. That the Commonwealth proceeded upon this theory is shown by the Eleventh Annual Report of the Commissioners on Public Lands (1862), in which appears the following statement: "The substantial and handsome building in course of erection on the land reserved for the Boston Society of Natural History, and other improvements during the past year upon the Back Bay, cannot fail to enhance the value of the lands remaining unsold."

If the Institute and Society of Natural History had not improved this square, it is fair to assume that the lots opposite, on Boylston, Clarendon, and Newbury Streets, would have sold for no more than $1.16⅔, the price paid on Berkeley Street. This would have amounted to $171,428.67. (There are 68,500 square feet in the lots facing on Boylston Street, 17,920 square feet on Clarendon Street, and 61,376 square feet on Newbury Street.) As a matter of fact, these lots sold, after the improvements on the square, for about $367,006.00, an average of $2.29 a foot on Boylston Street and $2.55 on Newbury Street. The lot nearest

Copley Square on Clarendon Street sold for $3.55 per foot, and the other for $2.67½. The dates of sales ranged from 1866 to 1876. The Berkeley Street lots were sold in 1859.

It is evident, then, that the Commonwealth received $195,577.33 more than it would have if the square had not been improved. If we subtract the then appraised value of the square, $154,500, we have $41,077.33, which is the amount the Commonwealth actually made from its gift to the Institute and Society of Natural History. It may be said that other elements entered into the increase in value; but the answer to that is that these figures are based upon only three sides of the square, and that, as a matter of fact, many other lots beyond were enhanced in value by the improvement, which would more than correct any error. It is, however, a well-known fact that there was a prejudice against made lands on account of their supposed unhealthfulness, and that, if this scheme of giving away a portion of the lots for the sake of the improvements had not been adopted, the success of the Back Bay enterprise would have been long deferred.

It is, therefore, not fair, in balancing the account of the Commonwealth with the Institute, to charge the Institute with even the then appraised value of the land.

In 1869,* the administration of the affairs of the Institute by the large society having proved too unwieldy, the legislature transferred its powers to the government of the Institute. The governor, chief justice, and secretary of the Board of Education were continued in the government; and the associate members of the Institute were made eligible to membership in the Society of Arts.

In 1870† the Institute was associated with the Art Museum by the act of incorporation, which provided that the Institute should appoint three of the trustees annually.

In 1871‡ the legislature passed an act to increase the "Morrill Act" fund to $350,000. The amount necessary was $141,575.35. The income from the two grants was

* Acts of 1869, chap. 97. † Acts of 1870, chap. 4.
‡ Resolves of 1871, chap. 89.

not separated in the auditor's accounts until 1882, so that it is impossible to state the exact amount which the Institute has received from the Commonwealth under this resolve; but it may be stated as the equivalent of a gift of one-third the amount set aside, or $47,191.78.

The right of the Institute to receive the one-third under the Morrill Act and the Act of 1890 was disputed by the Massachusetts Agricultural College, and was finally settled by the Supreme Court, in 1892, in favor of the Institute.* It was held that the legislature had full power to decide how the income should be distributed.

By accepting the grant from the United States the Commonwealth laid itself under obligation to the United States to see that instruction in agriculture and the mechanic arts be so encouraged that the gift shall be productive of most good; and the Institute and the Massachusetts Agricultural College may properly appeal to the legislature, when necessary, on this ground alone.

In 1872 the Lowell School of Design was opened in the Institute for the promotion of the art of industrial design, especially in connection with the textile industries of the State, thus inaugurating a policy upon which the Commonwealth set its seal of approval in the Textile School Act of 1895.

President Runkle was much impressed with the Russian system of shop instruction as shown in the exhibit of the Imperial Technical School of Moscow at the Centennial Exposition at Philadelphia; and on his return the School of Mechanic Arts was opened in the Institute, on the Russian system, for practical and scientific instruction in carpentry and wood-turning, blacksmithing, foundry work, pattern-making, etc. This experiment was successful, and manual training became from that time a part of the American system of education. The Institute had again laid the Commonwealth under obligations to it.

By the Act of 1873, chap. 174, the Institute received from the Commonwealth, on the same conditions as in the case of the first gift, a lot of 13,194 square feet, in the form

* *Massachusetts Agricultural College* v. *Marsden, Treasurer*, 156 Mass., 150.

of a trapezoid, at the intersection of Huntington Avenue and Boylston Street, in what is now Copley Square, for the erection of a building for the departments of mining and chemistry. The only remonstrants were the advocates of woman suffrage, who insisted on the condition that girls should be admitted to the Institute.*

Later it was thought best to make a public square of this land, and so the Institute was given the right to sell to the city of Boston. The deed was dated July 21, 1882, the Institute receiving $30,000. With this money it bought other land in the neighborhood, on which were erected buildings for the use of the School of Mechanic Arts and the Lowell School of Design at a cost of $52,-416.49. If a precedent is needed for the bill now pending in the legislature, this furnishes one.†

In 1886 the number of students had increased to 637 from 188 in 1878, which was the year when, after the financial crisis of 1873, the Institute reached its lowest registration. The expense of extra teachers, new equipment, and new accommodations made necessary by this increase brought on a condition of stringency which threatened to impair the efficiency of the Institute. The annual avails of the invested funds were about $22,000. Two-fifths of this had to be used to pay the interest on the outstanding indebtedness. Under these circumstances the Institute now for the first time appealed to the Commonwealth for financial aid. The sum of $200,000 was asked for to pay off this indebtedness.

President Walker said at that time, "The needs of the Institute are so great because it is itself so much needed." He called attention to the fact that scientific schools are necessarily more expensive than classical schools on account of the costliness of machinery and instruments and of the smaller classes. He adverted also to the fact that New England colleges have never sought to maintain instruction wholly through the fees of the students, but that it has been maintained as a principle in our educational

* A "Woman's Laboratory" was opened in 1876, and in 1883 all the departments were thrown open to women.

† Acts of 1875, chap. 195, and Acts of 1881, chap. 107.

system that a large part of the cost of college education should be defrayed from the proceeds of invested funds or out of grants of public money.

The legislature gave the Institute $100,000.* It nullified this favor, however, by requiring the Institute to maintain twenty free scholarships and to raise another $100,000 before the first payment of $50,000. While the policy of establishing scholarships is to be commended, they are always an additional burden, because, as in the case of the Institute, the student's fee is generally much less than the cost of his instruction. Three-fourths of the entire income came from the fees. In this case, if we consider that the fee, which was $200, would pay for the cost of instruction, it would mean a sacrifice of $4,000, which was about equal to the interest on the $100,000. The Institute declined to accept the gift on these conditions.

The next year President Walker went again to the legislature. The college year had shown an unprecedented increase of 83; and, as President Walker said, the Institute was poorer by the very cause which had multiplied its usefulness to the Commonwealth and country. The result was a gift of $100,000, without conditions, payable one-half in 1889 and the remainder in 1890. The gift of 1887 was renewed and accepted, and the $100,000 invested to support the twenty scholarships. Of this $200,000, then, only $100,000 can be charged to the Institute.

Not until 1895 was the Institute again obliged to apply to the Commonwealth for aid. The attendance had then risen to 1,183, a gain of 546 in eight years. The expenses had risen to the annual sum of $295,332.33. Over half a million dollars had been expended for land and buildings since the last appeal to the legislature. The total amount expended since the opening of the Institute had been $4,600,000, of which the Commonwealth and nation combined had paid less than nine per cent. The books showed a deficit of $23,210.03 for the year.

President Walker pointed out the vast amount of money spent on the Continent, by the different governments, for

* Resolves of 1887, chap. 103.

technical education. The rapidly increasing competition of the South and West with our manufactures had produced a great industrial crisis, and technical education would be the Commonwealth's most effective weapon in this great struggle. He called attention to the important services to education which the Institute had already rendered. It was the first institute of general technology founded in this country. It had led in the development of the theory and practice of scientific education the world over; and it had inaugurated the laboratory system of teaching which has since been adopted, not only in the technical schools, but in every classical college or university of respectable standing in the United States, as well as in the high schools and academies.

The legislature passed a resolve to appropriate $25,000 annually for six years for the Institute for general purposes and $2,000 annually for the establishment of ten free scholarships.*

The next year the thirty existing scholarships were increased to forty, with an annual appropriation of $4,000 to support them.†

In 1901 the annual appropriation of $25,000 was renewed for ten years.‡

In forty-two years the Institute has received from the Commonwealth only $377,191.78 which can properly be charged to it,— an average of less than $10,000 a year. The Institute has expended to date considerably over $8,000,000, of which the Commonwealth has paid only a very small percentage. The expenses of the Institute for the year ending Sept. 30, 1901, were $409,029.40, of which the Commonwealth paid $25,000 besides the $4,000 for scholarships.

The sum received during that year from students' fees — $252,987.75 — was not sufficient to pay the salaries of the staff, which amounted to $291,501.29. The expenses exceeded the receipts by $5,892.14.

In spite of the high standard maintained in the entrance

* Resolves of 1895, chap. 70. † Acts of 1896, chap. 310.
‡ Resolves of 1901, chap. 51.

examinations and in spite of the proposed increase in the fee to $250, the Institute continues its phenomenal growth. The demand for the kind of education which the Institute supplies is constantly increasing in the Commonwealth and nation. The registration this year is 1,608, of which 58 per cent. is from Massachusetts.

The debt which the Commonwealth owes the Institute is not a small one. The foresight of her founders has provided for the tremendous competition which the industries of the Commonwealth are now called upon to meet. The Institute is constantly adding graduate courses for original research; and one-half of its graduates, nearly 3,000 in number, are engaged in the industrial work of the Commonwealth. A still larger proportion of former students who for one reason or another did not take the full course of study at the Institute are similarly occupied.

As President Pritchett has said, "Technical education is recognized to-day as one of the great factors in industrial and commercial growth." England's commercial decline is in great part due to the neglect of her system of education. She can hardly be said to have had a system of education until 1870. Even the last education bill seems to an American incomprehensibly ineffective. On the other hand, Germany's great commercial progress is almost entirely due to persistent and well-directed efforts in technical education. The policy of establishing schools to train the people of a given district in the particular industries which are carried on in that district has been developed farther in Germany than in any other country, although France, and especially Switzerland, are close competitors for this honor.

England's original supremacy was due to the fact that she was the first to take advantage of modern inventions. Germany undertook to overcome this disadvantage by making her people more skilful through technical education and by opening laboratories where scientific investigations might be carried on for the benefit of her merchants and manufacturers. The result has been revolutionary in its force and extent. Perhaps the most striking example

is the application of science to the chemical manufacturing industries, which has given Germany pre-eminence in that field. Her great beet-sugar industries are almost entirely the product of this policy.

Successive international expositions, especially that at Philadelphia in 1876, had opened England's eyes; and Parliament appointed a commission to investigate the subject of technical education in America and on the Continent. The result was the Technical Education Acts of 1889 and 1900, establishing a system of technical education which, if it were supported by an efficient common school system, would revolutionize her industries. The Municipal Technical School of Manchester is typical. It has a most complete equipment, and the city alone gives it £20,000 annually out of the £30,000 necessary to maintain it. A large amount is contributed by the central government.

Mr. J. H. Reynolds, the director of the Manchester Technical School, who made a thorough investigation of technical schools in America and on the Continent, said, in a conversation with the writer, that he modelled his school on the Institute, as he considered it first in rank among the engineering schools of the world. Sir William Mather, himself a great manufacturer, as a member of the English Royal Technical Education Commission of 1882, pronounced the Institute "the finest technical institution in the world." Massachusetts, therefore, should be proud of the Institute, and should give it every opportunity to expand and extend its usefulness.

The present bill asks, in effect, that the Commonwealth shall simply carry to its full intention the deed of gift which she made to the Institute in 1861. The gift at that time cost the Commonwealth nothing, as has been shown. The present bill, if enacted, will take not one cent out of its treasury or add one iota to the burden of taxation. The Commonwealth can well afford to do this, and much more, for the Institute.

The surrounding land-owners have no just ground for complaint. But for the presence of the Institute and Society of Natural History, it is true, they might have pur-

chased for $1.16⅔ a foot instead of $2.50; but, as has been pointed out, that increase accrued to the Commonwealth, and not to the Institute; and now their land is worth between $20 and $25 a foot. In the case of the Central Congregational Church this unearned increment has accrued without the payment of a cent of taxation. The advance of mercantile buildings in that direction will tend to increase rather than to decrease the value of their land.

On one side of the question are seen the private interests of a few individuals. On the other are found the imperative needs of a great and growing public enterprise.

MYRON E. PIERCE, '96.

THE NAVY DEPARTMENT

I.

ORGANIZATION OF THE NAVY DEPARTMENT, AND OPPORTUNITIES FOR TECHNICAL GRADUATES

1. In order to explain fully the relations of technical graduates to the Navy Department, it is necessary first to outline the Department's organization. This is determined by Congress. At the head is the Secretary of the Navy; and by his side is the Assistant Secretary, with distinct duties, but ready at any time to become the acting head. The Department proper embraces nine distinct and independent divisions, each with a well-defined limit of action and authority, each receiving independent appropriations from Congress, and yet all intimately correlated and answerable to a common head. The nine divisions comprise eight bureaus: Yards and Docks, Equipment, Navigation, Ordnance, Construction and Repair, Steam Engineering, Supplies and Accounts, Medicine and Surgery, and the office of the Judge Advocate General. All the work of the naval organization, with occasional exceptions, is done through these various channels. Their duties are indicated by their names. Thus the Bureau of Yards and Docks has control of all land holdings, buildings, dry docks, and other improvements. The Bureau of Equipment supplies the ships of the Navy with coal, electrical apparatus, binnacles, rigging, etc., and retains the title to these articles when placed on a ship. The Bureau of Navigation is the fighting arm of the service, and prepares all orders to officers of the Navy, enlists the men, and controls the movements of vessels. In addition, this Bureau has direct charge of the Naval Academy, including the buildings and grounds. The Bureau of Ordnance manufactures and buys explosives and guns of all kinds. The Bureau of Construction and Repair has control of the hulls and structural features of all ships during their building, repair, and use, and also of navy-yard ship-building plants. The Bureau of Steam Engineering has charge of all boilers, engines, propellers, piping,

etc., on shipboard. The line of division between the work of the various Bureaus is somewhat arbitrary at times. For instance, the Bureau of Construction and Repair puts in place all metallic conduits for electric wires, in locations determined conjointly with the Bureau of Equipment; and the latter Bureau then places the wire.

2. As an example of how the Bureau system of the Navy is applied in the administration of naval affairs at a station removed from headquarters, a navy-yard organization may be cited. The yard is divided into independent departments, each one representing a Bureau in Washington. The head of the department is responsible for the property and work of the Bureau and for the carrying out of its orders. All orders and communications, however, must pass through the Commandant, who is the head of the navy yard. He is responsible for the discipline of the yard, for the enforcement of the orders of the Bureaus by the heads of the departments, etc., and altogether is an officer of great power. The organization of a ship at sea, with a captain at its head, is analogous.

3. It may be stated here that the Marine Corps, though a part of the fighting force of the Navy and under the authority of the Secretary, is distinct in its organization and *personnel* from the line and staff, and Bureaus of the Navy. Its organization is similar to that of the army. Its functions comprise guard duty on ships and at naval stations, and the forming of landing parties in case of warfare. Commissioned officers may be appointed from the Naval Academy (rarely at present) or by selection and examination from civil life.

4. The Navy Department being a military organization, the work in its various branches is directed principally by the commissioned officer. The head of each Bureau is a commissioned officer of high rank, and the head of each department at a navy yard or other station is also a commissioned officer of suitable rank. Only at isolated stations, and when no officer is available, is independent control given to a civilian. The commissioned *personnel* is divided into the following corps: the line, with 1,038 officers; the medical corps, with 194; the pay corps, with 133; the chaplains, 24; the professors of mathematics, 12; the naval constructors, 43; and

the civil engineers, 26. Nearly all, however, have been increased in addition to these numbers by recent legislation,— the naval constructors to 60, and the civil engineers to 40. The line officers do the work of the Bureaus of Navigation, Ordnance, Equipment, and Steam Engineering, and part of that of other Bureaus. The naval constructors do the work of the Bureau of Construction and Repair, and the civil engineers the larger part of that of the Bureau of Yards and Docks.

5. Appointments to the line and to the corps of naval constructors are made solely from the graduates of the Naval Academy. Appointments to the other corps may be made from the Naval Academy, but are usually from civil life. In the case of the civil engineer corps, which is the only one of the technical professional corps open to graduates of technical schools, only those having completed a course in civil engineering at a school of recognized standing are eligible. Examinations, which are held as vacancies * occur, cover the entire field of engineering from elementary mathematics to the most advanced practice, but all in a very rational and practical manner. About fifteen days are consumed, including the physical examination. The successful candidate is then nominated by the President, and upon confirmation by the Senate is commissioned as a civil engineer with the rank of lieutenant (junior grade). The past Congress established a corps of twelve assistant civil engineers, appointment † to which will be made in a similar manner.

6. All the civilian positions are filled by the Secretary of the Navy. Clerks, messengers, etc., are appointed from the lists of the Civil Service Commission. This was formerly the case with technical employees, such as draughtsmen, designers, inspectors, expert aids, etc.; but these are now appointed as a result of special examinations by boards of officers.

* Two civil engineers and three assistant civil engineers are to be appointed in the present year. The examinations will probably be held in May or June. Three additional assistant civil engineers, besides those necessary to fill vacancies, will be appointed each year until the corps is full. The salary of a civil engineer is $2,700 at the start and of an assistant civil engineer is $1,800.

† They will be promoted to the full grade by examination as vacancies occur from time to time.

7. *The Bureau of Yards and Docks.*— A vast amount of technical work is done by this Bureau. It is charged with the design and construction of a great variety of works, including dry docks, steel floating docks, quay walls, wharves, sewerage systems, water and fire protection systems, roads, buildings of all descriptions, coaling depots, yard railway systems, power plants, electric power and lighting systems, underground conduits, and dredging and filling of all kinds. So far as possible, the work both as to design and execution is under the direction of members of the corps of commissioned civil engineers, the chief of the Bureau himself being of this corps. Much of the designing is done at the office of the Bureau in Washington. A large staff of draughtsmen, including those skilled in structural steel work, general civil engineering practice, architecture, mechanical and electrical engineering, is employed under a chief draughtsman. At navy yards, where a civil engineer is stationed, designing of all kinds is also done, some of the yards having a force of a dozen or more draughtsmen. The engineering work at the yards, in addition to the designing, includes the laying out and direction of work done by day labor, and the supervision of that done by contract. These conditions offer the advantage to the young engineer of witnessing the actual construction of work designed by him. The civil engineer in charge has the sole supervision of all the designing, inspecting of contract work, the making out of contractors' vouchers, the direction of work by day labor, and the maintaining and keeping in repair of the extensive buildings and plant of the entire yard. His work is almost entirely of an executive nature, combining the duties of a chief engineer and manager. His problems deal, therefore, largely with the human element.

8. The duties of the civil engineer being mainly of a general nature, the actual design and inspection work must be left largely to his draughtsmen and inspectors. Accordingly, these have considerable latitude and responsibility,— a very usual condition throughout the government service. This results in splendid enthusiasm and in excellent experience for young men. Unfortunately an idea is given much credence that on any government work unlimited

sums may be obtained, and that, consequently, design and construction work are directed with a lavish hand. In rare cases this is true; but, as a rule, appropriations are limited, and considerable study is required to secure the most creditable structure for the money available, and in some cases it becomes necessary to solve almost impossible problems as to economy both in design and construction. Another impression which is general is that government work is of a character quite different from all other. This is true of many branches, but is not the case in most of the technical work of the Navy Department. It is true that business transactions of the government are usually somewhat complicated and involved, especially in cases where the disbursement of money is concerned. But the government, more than any large corporation, must have a definite system of conducting its affairs; and this is necessarily complex and inflexible at times. In design and construction, however, commercial standards are adhered to very closely, the requirements usually being abreast of the best practice, and at times slightly in advance.

9. *Bureau of Equipment.*—The technical work of this Bureau, besides that relating to ships, embraces the construction of coaling stations, the conducting of ocean, lake, and hydrographic surveys, the work of the Naval Observatory, and that in the office of the Nautical Almanac. The coaling stations coming under the cognizance of this Bureau are for isolated stations, as a rule, and are designed by the Bureau's force of draughtsmen in Washington. Civilian employees are frequently placed in charge of the construction work in the field. The ocean and lake surveys are mainly made by the ships of the navy, the work being done by the officers and crews. The same is true of the hydrographic surveys. The territory covered embraces a large part of the entire world. A great amount of exceedingly valuable information is collected, and put on charts which are issued by the hydrographic office in Washington. The Naval Observatory is located in Washington, and work of great scientific and practical importance is done there. The office of the Nautical Almanac is in charge of a member of the corps of professors of mathematics, under whom are numbers of computers and mathematicians.

10. In addition to the public works outlined above, structures of various kinds are in exceptional cases erected under the direction of other Bureaus. For instance, the construction of the buildings of the new Naval Academy, in charge of a member of the corps of civil engineers, is under the direction of the Bureau of Navigation. The same is true of the various large training stations. Other work of a similar nature, but of a less important character, is done by the Bureaus of Ordnance and of Medicine and Surgery. In these cases a civil engineer officer is frequently placed in charge, when available: otherwise, the Bureau calls in the necessary assistance from the profession outside the Navy.

11. Taken as a whole, the Navy Department, in the work above outlined, affords excellent opportunities for technical graduates, especially for the younger men. One of the chief characteristics of the work is its similarity to that in common practice elsewhere. In other words, the graduate in its service does not necessarily become a government specialist, and may have opportunities to step out if he chooses.

R. E. Bakenhus, '96.

II.

SHIP-BUILDING WORK IN THE NAVY.

Leaving now the particular navy-yard work which is concerned with the buildings and the lay-out of the plant, there is the more definite department having specially to do with the vessels themselves. In many yards the department of Construction and Repair is the most important of all the branches of the Navy, employing more men and attacking more work. In fact, all overhauling and repairs to vessels, with the exception of those made on engines and boilers and certain electric appliances, come under its jurisdiction, making it apparent that a very large amount of work is involved. In the draughting room of the Construction and Repair department is the principal opening for "Tech" men. There is an exceptional chance to notice where details have gone wrong,— an opportunity which is not granted in all outside work. It is not

difficult to do the best one can; but, until one is sure that it is the best that can be done, he cannot rest contented. In no small measure, work at the navy yards is correcting constructions devised outside; and it is an intimate acquaintance with the way things give out that is valuable in the typical navy-yard experience. At this time, however, the battleship "Connecticut" is being built at the New York Navy Yard, and these ideas must be modified as far as they pertain to work on this particular vessel.

For knowledge of actual ship work, a position in one of the Superintending Constructors' offices is, however, most to be preferred. At all the ship-yards in the country where government contracts for the Navy are under way, an officer, known as a Naval Constructor, is stationed to supervise the work. From the very begining of preparation of the ways to the departure of the completed ship from the ship-yard, all features of the work on the hull of the vessel are carried on under the cognizance of the Superintending Constructor. As one of his assistants, it is impossible to have the consequent intimate acquaintance with the work and avoid absorbing information of the greatest practical value. In the preparation of finished plans, or drawings of the ship as she is actually being constructed, a new man in the office is able to gather information valuable to the government and to himself. Familiarity with the details is bound to lead to the opportunity for checking of plans submitted by the contractor for the construction of the vessel. This latter branch of the work, carried on by the Superintending Constructor's force, is by far the most interesting in the government offices, and implies a thorough knowledge of the art, as well as the science, of ship-building. In fact, it has been remarked that ship-building is an art, and not a science; and some would be almost prepared to accept *in toto* this view. The chief draughtsman of the Bureau of Construction and Repair at the present time is a man who has worked up from the yard; but he holds his position — the highest a civilian can attain — by personal ability and thorough understanding of ship structure. It would be incorrect to limit the necessary knowledge to ship structure, however; for the modern battleship is a compilation of all the accommodations for a colony

of 800 men; — sleeping requisites, cooking conveniences, sanitary necessities, luxuries like laundries, letter-boxes, and libraries, and a multitude of details requiring special and accurate knowledge. In addition there is an electric light plant adequate for a small village, a ventilation system, provisions for pumping water from the ship, ammunition conveyors and hoists, and electric motors and all their appurtenances. Again, there is the *raison d'être* of the whole machine, the guns; not to mention the armor. And, finally, there are the engines and boilers which make the fort more than a battery ashore. The ramifications of these features produce a complication which is astonishing to the uninitiated. And generalities do not count in the work, but a detailed and specific knowledge of every part and fitting.

A step removed from actual practical work on a vessel is that carried forward at the Bureau of Construction and Repair in Washington. Besides the calculation work continually under way, the Bureau acts as a clearing house for questions arising during the progress of work on vessels; but there is not the intimate acquaintance with the sphere of action and close communion with the roar of riveters that is so omnipresent at a ship-building yard. It is an academic life in comparison, with a corresponding opportunity for study, though to take an active part in it experience at a ship-yard is absolutely indispensable.

It should not be gathered from the foregoing that the Bureau of Construction and Repair is the only department having interest in the ship. Cognizance of the boilers, propelling machinery, and certain other fittings, is given to the Bureau of Steam Engineering; but its organization is different in some particulars from that of the Bureau we have been describing, and work at its offices at the private ship-yards does not prove so valuable. There is more of a centralization of activity in the Bureau of Steam Engineering at Washington. The work, as distinct from that which has been described, tends to approach a scientific basis, and is along a more self-contained line, susceptible to a different treatment.

More of specialization still is found in the work coming directly under the cognizance of the Bureau of Ordnance. At the Wash-

ington Navy Yard there is the noted gun factory where practically all of the large calibre guns for navy vessels are made. A large force of draughtsmen is employed working up the details of the guns and mounts and devising new and improved methods of their operation.

Besides its part in the lay-out and operation of a navy-yard plant, the Bureau of Equipment is concerned with the electric generators and portions of the electric wiring on board vessels building under contract, so that in its inspection offices there is an opportunity for work along electrical subjects. In many cases it is difficult to draw the course of the zigzag division between the duties of Bureaus, and for this reason there is the opportunity for specialization under many branches of the Navy Department.

An interesting enterprise carried on by the Bureau of Construction and Repair is the model tank at the Washington Navy Yard. "Tech" men have been intimately concerned in its construction and development, and valuable data pertaining to ship propulsion are constantly being secured.

The prosaic detail of pay cannot be passed over; but, in touching on it, generalities are indispensable. The limits are, with the exception of a few positions, about $3 and $6 per day, with gradations between. Examinations are a strong point of the system; but backed by familiarity with the practical side of the work, to be attained only by actual acquaintance with construction, they are not formidable antagonists. The work is interesting from the comprehensiveness of it, and there is a possibility of securing in a few years a wider variety of experience in government employ than would be likely in the office of a private concern. Advice as to life-work for the government is too dependent on the personal element to make it appropriate, and I can only emphasize the broad ground of patriotism as a thing not to be neglected when one is determining upon his career.

FREDERICK A. HUNNEWELL, '97.

EDITORIALS

Although many of our readers may have seen the recently published Annual Report of the President and Treasurer of the Institute of Technology, the REVIEW makes no apology for reprinting, in another part of this number, extended extracts from so interesting and important a document. For in this report, in even greater degree than usual, are discussed questions vital to the Institute,—questions which deeply concern every one of the many thousands to whom the Institute's B.S. is not only the seal of four pleasant and profitable years, but is also the very hall-mark of their professional careers. To no one is it more evident than to the alumni that the present is the crucial epoch of the Institute's life. Once a conspicuous pioneer, it is now but one among many colleges of applied science. Whether or not it is to remain *primus inter pares* the next ten years will, perhaps irrevocably, decide. And that it shall retain the leadership which is now unhesitatingly conceded to it is a question not of mere college pride, but of vital professional moment to every man who holds the Institute degree. Explicitly or implicitly the President's Report presents, with the weight of official utterance and of a keen and far-seeing intellect, matters which are largely to determine the future of the college with whose progress during 1902 that report so ably deals. Chief among these points are four: the question of the phenomenal growth of the Institute as it relates to the problem of urban or suburban location; that same question as it affects administration and teaching; the moral obligation of the Institute to its students; and the old yet ever new question of "culture studies" *versus* professional work.

Taking up the last-mentioned matter first, the simple announcement that "the Executive Committee has decided to discontinue the Course in General Studies, at least in the form in which it is now offered," is the first official notice of a very important step.

It is greatly to be hoped that the qualifying clause means that eventually the General Course (which has always suffered from its vague and somewhat meaningless name) is to be expanded into a course which many alumni and friends of the Institute have been for a number of years urging,— a Course in Commerce, or (better, perhaps) in Commerce and Industry. Such a course those who are familiar with the development of education cannot fail to see is demanded, not simply by despised "practical" men, but also by leaders in education and in statesmanship.* These leaders, realizing that trade expansion is to be the motor-force of the coming generation, are solicitous lest the development of the United States, in this direction, be controlled by ignorant "promoters" and selfish "exploiters" instead of by educated and broad-minded men. Therefore, they are urging that American colleges take immediate steps to develop courses of study which shall prepare young men intelligently and seriously to deal with the great questions of domestic and foreign trade, of transportation, of finance and of international relations.

Few colleges have so good an opportunity or such immediate adaptability for a course like this as has the Institute. Questions of commerce, of transportation, and of lesser diplomacy, are directly in the line of men trained as are those of the Institute. For our graduates have secured a broad substructure of modern languages, history, economics, and upon this have built up a special super-

*Just as these editorials were going to press, Mr. Vanderlip, formerly Assistant Secretary of the Treasury, is reported to have made the following remarks, on March 19, at the dinner of the Commercial Club in Boston: "I can think of no more fruitful field of inquiry for this Commercial Club than that of the need of a school for training young men for international commerce. I believe, if you would make a study of that question and would come to realize what a great impetus could be given our foreign trade by a school which would turn out young men thoroughly equipped to enter such a field of activity, you would find yourselves enthusiastic advocates of some radical departures in education, and, if, as a result of such investigation, you should graft on to one or more of your great institutions of learning a course intelligently designed for this purpose, you would not only be offering golden opportunities to your young men, but you would be placing the whole commercial country under another debt of obligation to you, because you would again be ready to send out into a new field New England men, with New England characters, equipped for their task with New England thoroughness."

structure of scientific knowledge and technical experience, such as trade, transportation, and what may be called administrative industry specially demand. In Professor Dewey's admirable article in Volume III. of the REVIEW (p. 141), although he deals with the question of "Education for Commerce" in a broad way, he makes clear to those familiar with the present General Course the very practicable and easy line of expansion along which that course may be evolved into an ideal preparation for young men who, in rapidly increasing numbers, are going into the professions (for "profession" is not too dignified a word) of internal and foreign commerce, of banking, of transportation, and of consular and diplomatic service. It cannot be many years before the educated common sense of the American people will demand an overhauling and a partial remodelling of our whole commercial and consular structure; and the Institute will lose a conspicuous opportunity — an opportunity which is right within her hands — if she does not have young men ready to be pioneers in that, as they have been in so many other professions. If the vote of the Executive Committee means such expansion as this, the alumni will rejoice at the giving of this new life, this broader and more definite direction, to the General Course. If it means, on the other hand, any lessening of emphasis upon the fact that the Institute is determined to graduate not simply technically trained engineers, but broad-minded men, then they cannot but view this step with well-founded uneasiness.

While the President's Report tells a gratifying story of growth during the last few years, it sets forth no less plainly the embarrassing problems which this rapid expansion is bringing in its train. The most obvious of these is the simple physical one, the mere mathematical problem of how to provide recitation-rooms, laboratories, and other teaching mechanism for such an aggregation of young men. So pressing has this problem become, and so rapidly is the tide of business welling up around Copley Square, that the Institute finds itself sharply confronted with the question of a possible change of location. In its issue of July, 1902 (p. 307),

the REVIEW presented, in what it believed to be a fair spirit, the two sides of the question. The President honors us by a courteous reference to this paper, and gives it as his opinion that the points in favor of removal "greatly outweigh those against it." And he proceeds cogently to set forth a point which the REVIEW article did not sufficiently emphasize,— the fact that the Institute, as a great school of architecture and of engineering, should, in its buildings and in its life, exemplify the best and highest principles of these noble sciences.

Directly or by implication, the President argues that a removal of the Institute, forced upon it more or less by the encroachments of trade and by the consequent enhancement of the value of land in the vicinity of Copley Square, will in the end prove to be the wisest possible step. It will permit of the erection of buildings worthy of our justly famous school of architecture; it will allow of the practical application of many of those principles of engineering which our present situation makes impossible; it will clarify to an extraordinary degree the difficult problems of teaching and of administration; and, as he shows, it will enable the Institute to deal adequately with the important problem of "furnishing to its students such facilities as will make the student life economical and simple, yet attractive to rich and poor alike." That the REVIEW believes in the assumption, by the Institute, of greater responsibility for the social and moral life of the students, those who have read its Editorials need not to be told. In every volume since the first, and almost in every number, the importance of the personal factor in the education of young men has been strongly emphasized. The moral tone of the Institute under-graduates is, without any question, extraordinarily high; but, with increasing numbers, the moral side of collegiate education becomes always more serious. In order that this problem may be dealt with wisely and adequately, it seems necessary for the Institute students to be gathered together in dormitories — or, in Dr. Pritchett's plan, "Student-houses" — where they may be under the control of the authorities, and where, better still, they may be under the much

more effective influence of student opinion. All the "proctors" in the world cannot keep order in a community where public opinion is unruly or immoral; but, while the Institute cannot be wholly free from black sheep, the predominant tone of its students is so sober, so earnest, so manly, that one needs but to concentrate this opinion in a student community for it to keep lawlessness in check, and, more than this, to uplift many a weak fellow to a higher plane of living and of aspiration than would otherwise be possible to him. To assume a measure of parental responsibility will add, no one can predict how much, to the already heavy burdens of the Institute's Faculty; but, if it seems to them the right thing to be done, they who in the past forty years have taken so many brave steps into the unknown and the untried will not hesitate to take this one step more.

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The two hundred and ninety-sixth meeting of the Corporation was held at the Institute March 11, 1903. Appointments by the Executive Committee were confirmed as follows: Gragg Richards (S. B. Harvard), as Assistant in Geology; Robert Vaughan Brown, '02, as Assistant in Inorganic Chemistry; George Edward Bradley as Assistant in Metal Work; Leonard David Dickinson, '96, as Assistant in Electrical Engineering; Harold Bartlett Litchman as Assistant in Mining Engineering and Metallurgy; Frederic Willis Snow, '00, as Assistant in Mining and Metallurgy; Jacob Lloyd Wayne, '96, as Assistant in Mechanical Engineering.

In January, pursuant to a vote of the Corporation, the Executive Committee, through President Pritchett, presented a petition (House Bill No. 438) to the General Court "That certain lands in Boston be given to the Massachusetts Institute of Technology in fee simple." A hearing on this bill was given on March 11 by the Ways and Means Committee, President Pritchett, Mr. Lucius Tuttle, president of the Boston & Maine Railroad, Major Henry L. Higginson, Hon. Eben S. Draper, A. Lawrence Lowell, Esq., Professor Elihu Thomson, and Mr. William Endicott speaking in favor of the bill. On March 25, the bill having already passed to a second reading of the House, remonstrants asked that the bill be recommitted, claiming that sufficient notice had not been given of the hearing. As a result, a new hearing was given and was held on April 2. Thomas H. Russell, Esq., Edward L. Rand, Esq., counsel for Messrs. Suter and Dexter, owners of property on Newbury Street; R. M. Saltonstall, Esq., representing Mr. Francis H. Peabody; F. W. Kittridge, Esq., representing the Hotel Brunswick property; Charles T. Gallagher, Esq., representing other owners on Newbury Street; and Edward H. Eldredge, Esq.,— appeared in remonstrance. W. L. Putnam, Esq., Mr. A. G. Webster, Felix Rackemann, Esq., and President Pritchett spoke in favor of the petition.

FACULTY NOTES

On March 4 the Faculty, at its regular meeting, adopted by a rising vote the following resolutions : —

The President and Faculty of the Massachusetts Institute of Technology, in regular session assembled in the Rogers Building, desire to extend their congratulations to Mrs. William Barton Rogers on this her seventy-ninth birthday.

They recall with profound gratitude and satisfaction the services rendered to the Institute by her distinguished husband, Professor William Barton Rogers, its founder and first President ; and they congratulate her upon the extraordinary development and honorable reputation of the Institute which President Rogers so long and so faithfully labored to establish, and in the inauguration and care of which he was always zealously seconded by Mrs. Rogers herself.

It is almost exactly thirty-eight years since the preliminary session of the school of Industrial Science was opened, with an attendance at the outset of fifteen pupils ; and the Faculty rejoices in the fact that Mrs. Rogers has lived to see the growth from this small beginning of an institution having at the present time some sixteen hundred students, of whom one hundred and seventy are graduates of other institutions, and exerting a powerful influence for good upon the life of the nation.

Among the most precious possessions of the Massachusetts Institute of Technology will always remain the records of the grace and eloquence, as well as the wisdom, the scientific attainments, and the noble character of its founder and first President, William Barton Rogers.

Committees of the Faculty have been appointed in connection with the preparation of the exhibit for the Louisiana Purchase Exposition, at St. Louis, and with the approaching meeting of the National Educational Association. The Association holds its annual meeting in Boston, July 6 to 10, with a probable attendance of some twenty thousand teachers from all parts of the country. The headquarters will be located in the Rogers and Walker Buildings, and many public buildings in the vicinity will be in use for meetings.

The Institute was represented at the inauguration of President Bryan, of Indiana State University, by a delegate from the Northwestern Association.

The Geodetic Option of Course I. has been discontinued, with the expectation that students desiring to specialize in this direction may be able to do so after graduation. The Graduate Course in Chemistry has been revised, and two new programmes are offered in Naval Architecture. Arrangements have also been made by which graduates in Mechanical Engineering of the Institute or in equivalent courses elsewhere may take the professional work of Course XIII. in one year. Several graduates of Annapolis have joined the class of Naval Architecture which entered last fall, this unexpected increase being due to the pressure for additional men in the navy service.

Mr. George Curtis Glover, of the class of 1900, has been awarded the Perkins travelling fellowship in architecture for the year, and will leave shortly for Europe. Mr. George V. Sammet, '01, has been awarded the Austin fellowship for graduate study in chemistry abroad.

The April recess was last year shortened by one day on account of the suspension of exercises on two afternoons of the "Tech Show." This year the plan provides for a suspension of exercises on both days of the Show and on the 20th of April only.

A committee has been appointed by the Faculty to report on the maintenance of a General Course in succession to or in continuance of Course IX.

PUBLICATIONS

The catalogue for 1902–03 shows a number of changes of form. In the Course schemes the divergence in the second term of the first year has been materially diminished. The announcement in regard to graduate courses is considerably extended with the addition of a brief statement in regard to the Graduate School of Engineering Research.

In regard to entrance examinations, announcement is made that examinations are now held in Boston only, but that in June examinations are held at many points in the United States and foreign countries by the College Examination Board.

It is stated that physics will probably be made an absolute requirement for admission in 1905.

The old schedule of topics, now known as the Subject Schedule, is much improved by rearrangement.

The discontinuance of the bond heretofore required by the Bursar is announced, with a statement that deposits will be required of students taking work in the chemical or mining laboratories.

The list of graduate students occupies nearly seven pages. The list of special students is changed in form by giving course numbers instead of subjects taken.

These changes and the typographical condensation of the Register of Graduates have resulted in making the catalogue somewhat smaller than last year in spite of the increase in the number of students and the addition of nearly two hundred graduates. Further changes of form of the catalogue are likely to be considered for the coming year.

A new circular on the Department of Chemistry and Chemical Engineering is in press, and the usual announcement of summer courses will be issued shortly.

LIBRARY CHANGES

Two new department libraries have been established,— a Modern Language Library in Room 20, Lowell Building, the books being taken from the general library, and an Electrical Engineering Library in Room 3, Lowell Building. This makes a total of eleven department libraries. The general library now contains the English, Military Science, and for the present the Walker Memorial Libraries. The last-mentioned collection, the gift of an alumnus, contains books and periodicals on athletics, sports, and physical training.

GENERAL NOTES

On the evening of Wednesday, April 8, an informal dinner, given to Professor Charles H. Wing, who was in charge of the chemical department at the Institute from 1875 to 1885, was held at the Technology Club. About twenty of those who had been most closely associated with him were present; and letters of regret, ex-

pressing much affection and esteem, were received from about the same number more who were prevented from being present. Professor Crafts presided; and pleasant reminiscences of the early days of the Institute were given by him, by Professor Wing, by Professors Richards, Lanza, and Talbot, and by Messrs. J. P. Munroe and W. S. Allen.

George E. Hale, '90, Professor of Astronomy in the Chicago University and Director of the Yerkes Observatory, was presented by the Academy of Arts and Sciences, at its meeting on April 8 at Cambridge, with the Rumford Medal of the Academy in recognition of his astrophysical discoveries and, specifically, of his invention of the spectroheliograph, by means of which the solar prominences can be photographed without an eclipse and details of the solar surface (sun-spots and faculæ) can be reproduced with remarkable precision. The important researches of Professor Hale were reviewed by Professor Charles R. Cross, chairman of the Rumford Committee, after which the medal was presented by President Agassiz. Professor Hale then gave an address, illustrated by many stereopticon views, describing interesting portions of his own work.

Dr. Morrill Wyman, the eminent physician who died in Cambridge January 30, was, from 1865 to 1869, one of the four vice-presidents of the Institute under the plan of organization now superseded by the present Corporation. Dr. Wyman was a near friend of Dr. William J. Walker, whose interest in the foundation of the Institute proved so determining a factor at a critical time. His reminiscences of Dr. Walker went back even to the time when the latter, as a young medical student, was present in Paris in the days of Napoleon I. During the closing years of Dr. Wyman's life he has been engaged in preparing a biography of Dr. Walker.

In March the Orpheus Musical Society of Boston celebrated its golden jubilee with a concert, a banquet, and other festivities. These were presided over by the president, Professor Frank Vogel.

At the annual reunion of the Bowdoin College Alumni Asso-

ciation, February 18, Professor Alfred E. Burton was re-elected president of the Association.

EXTRACTS FROM THE ANNUAL REPORT OF THE PRESIDENT AND TREASURER, MADE TO THE CORPORATION DEC. 10, 1902

During the year the Corporation has elected two non-resident professors. This title has been given to men of distinguished attainments who, while not being bound to the full duties of a professor, nevertheless give courses of instruction. Under this arrangement, Mr. Elihu Thomson has been elected Non-resident Professor of Applied Electricity; and Mr. Percival Lowell, Director of the Lowell Observatory at Flagstaff, Ariz., has been elected Non-resident Professor of Astronomy. . . .

By vote of the Executive Committee it has been decided to discontinue the course in General Studies, at least in the form in which it is now offered. This course was intended to appeal, from its nature, to a large number of men, being a general rather than a technical course. This has not followed; and, while the work of the course itself and the training which students receive in it have commanded the highest approval, the course has during its existence appealed to but a small number. . . .

In a former report I have called attention to the generosity of two members of our Corporation, Mr. A. Lawrence Lowell and Mr. Percival Lowell, and of their three sisters, Miss Amy Lowell, Mrs. William L. Putnam, and Mrs. T. J. Bowlker, in their gift of $50,000 for the purpose of a laboratory of electrical engineering. To this sum Mr. George A. Gardner, another member of the Corporation, added $10,000, Mrs. W. S. Fitz $2,000, and Mr. C. C. Jackson $3,000, making in all a sum of $65,000. In recognition of the great service rendered to the Institute by the late Mr. Augustus Lowell the Corporation voted to give the new laboratories his name. . . .

The current publications, the Catalogue, the Department Circulars, the *Technology Quarterly*, and the TECHNOLOGY REVIEW, have been issued in the usual manner. The REVIEW contains in an interesting and complete form the news of the year, appropriate space being devoted to the discussion of such questions as arise in the conduct of the work itself. It is hoped that members of the Corporation and of the alumni may find here an interesting and satisfactory means of keeping in touch with the work of the Institute. . . .

The Corporation, since my last report, has voted to raise the annual tuition fee from $200 to $250, this advance to take effect with students entering in September, 1903. . . .

In no institution does the student pay the full cost of his education. . . . In a technical school not only is the expense per student greater than in academic education, but growth of numbers means a far greater growth of expense as compared with college expenses; for such growth means increase in laboratories, expensive in their first cost and expensive to maintain, and it involves a far greater increase in the instructing staff than in the case of the teaching of Latin or Greek or history. . . .

The Institute of Technology has but a small endowment in comparison with the larger universities. In addition a large part of its trust funds is devoted to scholarships; and, as each student costs much more than the amount of tuition, every gift for scholarship purposes increases the load which the endowment carries.

In view of these considerations it has seemed wise to increase the tuition. It is believed that, with a larger grant than heretofore from the Austin Fund for scholarships, this increase will not impose upon students of small means greater difficulties than now present themselves. The annual fee, even with this increase, is still far below the average cost to the Institute for each student.

In comparison with the cost of the ordinary college education it is to be remembered that the technical school not only expends upon each student a much larger sum than the college, but it is also true that the graduate of the college must still prepare himself for a profession after completing his college course, while the graduate of the technical school finds himself in possession of a training which commands an immediate remuneration. For some years the demand for graduates of the Institute has been far in excess of the number of graduates. The value of its diploma will be greater for each graduate in just such measure as its instruction and its facilities are keeping abreast of progress and are in position to profit by all advances. . . .

Elsewhere, in the statistical part of this report, is given the customary information which is collected from year to year concerning the membership of the student body. I quote from these data the figures which give the registration for the past four years.

1899–1900	1,178
1900–1901	1,277
1901–1902	1,415
1902–1903	1,608

Notwithstanding the increase in tuition, the preliminary examinations for next year indicate an entering class in 1903 as large as that of the present

year. Upon such growth certain fair limitations, which the Faculty will doubtless impose, may be placed by a more strict scrutiny of the examination papers; but such restriction as this may in the end have no marked effect upon the attendance, for the rejection of weaker men will continually make the Institute more attractive to the stronger men. While certain causes, such as industrial depression, might temporarily stop the growth of the Institute, there seems no reason to doubt that we may expect, under ordinary conditions, a fairly regular increase in our numbers. . . .

The idea has been more than once brought forward that an arbitrary limit should be set to the number of undergraduate students admitted to the Institute, and the plan has long been in force in certain foreign schools of high standing.

While it is desirable to impose conditions of stricter scrutiny upon candidates for admission, so as to keep out those who are intellectually and physically weak, or who are insufficiently prepared, I should be sorry to see arbitrary limitations placed upon incoming students who are well qualified for our work, whether those limitations come in the form of high tuition or in the form of limitation of the number of students. In a growing country, where a continually enlarging demand for technical education will, as a matter of course, send an increasing number of students into the technical schools, a steady growth in numbers is a natural feature of institutional development. The technical school may well share with the country itself the problem of meeting the demands which a growing constituency implies. . . .

Still the essential fact remains that the real limit of the work of an institution is not to be found in the number of its students, but lies rather in the limitations of its administration, of its instructing staff, or of its facilities. If these are made to keep pace with the growth in numbers, the quality of instruction may not only be maintained, but it may be continually advanced. The institution, however, which enters upon such a policy should face the whole situation, it should strengthen its instructing staff to keep pace with its student growth, and should so plan its buildings and its laboratories that they may be expanded with expanding needs. . . .

As I have already pointed out, the Institute has at command about 70,000 square feet of land upon which it may build. This is wholly inadequate to serve as a basis of development for the future. To purchase additional land adjoining our present site seems to me not only beyond our means, but undesirable as well. It is essentially uneconomical for an institution of learning to occupy land having so high a commercial value.

The time has come, in my judgment, when we should ask the General Court to remove from the land which we own on Boylston Street the restrictions that were placed upon it in the act of gift. In case this is granted, we should then look about for a site of not less than thirty acres, which shall still be near enough to be in touch with the industrial life of the city, which shall be accessible from the various railroad stations, and where the Institute may develop in such way as the demands of the future clearly indicate.

For a discussion of the advantages and disadvantages of such a plan, I refer you to the July number of the TECHNOLOGY REVIEW, which most of you have doubtless seen. . . .

To my thinking the arguments in favor of a transfer of the Institute to an accessible site greatly outweigh those against it. Not only is it true that the overcrowded condition of our buildings is becoming every year more of a source of weakness, that the loss of time in passing from one group of buildings to another is becoming more difficult to bear, but the inconvenience of sending sixteen hundred students back and forth across a crowded highway like Boylston Street is causing each year an increasing loss of time. There is a general ground upon which the whole question rests, which seems to me still more worthy of consideration. It is this: the Institute of Technology exists, not simply as a school to train men for architecture or for engineering, but it exists also as a centre of intellectual and moral activity. As such it should exhibit in the conduct of its work the principles for which it stands. Thus it has a school of architecture, ably conducted: its buildings ought to express architectural beauty and truth, while standing at the same time for academic simplicity. We maintain courses in heating and ventilation and sanitation, and we should show in the management of our own lecture-rooms and laboratories the same principles which we teach. It is impossible to do this in the overcrowded condition of our present buildings. . . .

Over and above all other things, I believe the time has come, particularly in New England, when institutions of learning should set before the eyes of students their own ideals of a wholesome, democratic, and simple college life. Any student of the conditions of American college life can but be alarmed at the increasing sum which is required to send a boy through college; and it is time that some institution should deliberately set itself to work to solve the problem of setting forth a college life that should give to the poor student the opportunity of economical living, and at the same time the opportunity of social intercourse with his fellows. College life has been set at such a pace that the poor student is practically barred from participation in social life, unless he be, perhaps, an athlete and finds his expenses

met by his athletic abilities,— a state of affairs not wholly desirable. To my thinking there is no better problem to which the Institute can devote itself than to that of furnishing to its students such facilities as will make the student life economical and simple, yet attractive to rich and poor alike.

Should the Institute adopt a plan of removal, I hope that it may undertake to deal with this problem ; and, in order to do so, a system of dormitories or student houses would need to be erected upon the new site. To accomplish the end in view, these dormitories or student houses must be maintained in a different way and upon a different principle from those ordinarily adopted. They must not be counted on as a source of revenue, but must be used to furnish the best means of living at little more than cost. I would suggest as an experimental plan some such arrangement as the following: two quadrangles, consisting of four buildings each, each quadrangle accommodating approximately five hundred students, the lower floor of each building to be devoted to sitting-rooms and dining-rooms, and the upper floors to bedrooms and occasional suites for those who desire more expensive quarters. I should call these houses rather than dormitories, as they will, in their essential features, be more akin to the English University Houses than to the American dormitories. Each house would form a union, its students meeting in the dining-hall and for social intercourse. The entire group of houses would be lighted and heated by a central power plant, in which would be located the central kitchen, a refrigerator plant, and a laundry. With such a plant, I believe, we might successfully undertake to solve the problem of the economical housing and feeding of students. With proper system and with business methods, buying provisions at wholesale, I have no question but that we could offer the student lodging and food at prices far less than our students now pay for uncomfortable lodgings and for unsanitary food, with the additional advantage that the general mass of students would be thrown together under the influence of a simple and democratic social life. . . .

I am satisfied that few appreciate the economic and hygienic waste which comes in the housing and feeding of a body of students taking up their work in a new and, to most of them, unknown city. Boston is an expensive place as American cities go. The student who comes here from a distant place, particularly if his means are limited, undertakes to house and feed himself as cheaply as possible. In his effort to do so he not only isolates himself from his fellows, but he oftentimes finds himself in quarters which are morally and physically undesirable. A number of students eat unwholesome and insufficient food, and pay for it prices which, under such a plan as that I have out-

lined, would furnish wholesome and sufficient food. The entire lack of any plan for the housing and feeding of students involves a moral, economic, and social waste, and I know of no better problem with which an institution like this may deal than that of stopping this waste. . . .

Courses I. and XI. Civil and Sanitary Engineering.—There has been an even greater demand for our graduates this past year than before. Including the retiring assistants, forty men were available for positions last June. From May 1 to November 1 applications were received for between one hundred and fifty and one hundred and sixty men, and such applications continue to be received almost daily.

The fifteenth session of the Summer School of the department was held during the past summer at Ellsworth, Me. Eleven students were in attendance. The school was in charge of Professor Burton, assisted by Professor Robbins, Professor Barton, Mr. Sweet and Mr. Hosmer, together with Mr. Nelson and Mr. Seabury of the class of 1902. . . .

On July 2 a portion of the school made a trip to Nova Scotia, visiting the Joggins coal mines and fossil beds. On the return a stop was made at Moncton, N.B., and photographs were obtained of the tidal bore. . . .

Course II. Mechanical Engineering.—The American Society of Mechanical Engineers held their spring meeting at the Institute in May, their opening session being held in Huntington Hall. . . .

The American Foundrymen's Association held a successful meeting at the Institute in June, during which the members paid a visit to the laboratories of the department.

In September an enthusiastic meeting of the National Association of Stationary Engineers was held in the rooms of the department, and its laboratories were visited by members of the Association. This meeting was the largest and most successful yet held by the Association, fourteen hundred and sixty-four members and guests being in attendance. . . .

Course III. Mining Engineering and Metallurgy.— The summer school of Mining Engineering was held in Nova Scotia and Cape Breton, thus affording a good opportunity to see the mining of gold and of coal, as well as the coking of coal, the smelting of iron, and the making of steel in open hearth furnaces. . . .

The instructing staff consisted of Professor Richards, Mr. Locke, and Mr. Sawyer; and nineteen students took advantage of the opportunity. . . .

Course IV. Architecture.— The department is this year working to its full capacity, and it has been found necessary to make use of the exhibition room for recitation purposes.

The greatest need of the department is a museum of building-models and appliances. The demand is for the best practical training that can be given for immediate usefulness when office life begins, and as an aid to this a well-equipped museum, to which manufacturers would be glad to contribute, would be invaluable. . . .

Courses V. and X. Chemistry and Chemical Engineering.— The most important changes in this department are those made in the instruction in inorganic chemistry and in industrial chemistry. Special effort has been made to enrich the instruction in first year inorganic chemistry and to increase its effectiveness. The lectures are given by Professor Talbot, and nine other members of the instructing staff co-operate with him in the conduct of the recitations and laboratory work. Radical changes have been inaugurated in the laboratory work in industrial chemistry in connection with the appointment of Professor W. H. Walker. . . .

A Summer School of Industrial Chemistry was inaugurated last June, attended by fifteen students. The plan of instruction included visits to typical manufacturing plants representing important chemical industries, the series of visits covering a period of two weeks. The details of the trip were carefully worked out in advance by Professor Thorp, who, with Professor Talbot, accompanied the students. And in connection with the inspection of the plants conferences were held each evening at which a brief statement of the principles underlying the processes to be inspected on the following day was given by Dr. Thorp, and reports were made by each member of the school upon a specially assigned portion of the plants inspected during the previous day. Elizabeth, N.J., was made the headquarters of the party for the first week, and Philadelphia for the second week. . . .

Course VI. Electrical Engineering.—A number of changes are contemplated in the courses and in the methods of instruction, to take effect next year. It has not been practicable to modify the course of instruction greatly during the present academic year, though a few additional lectures will be given, including a course on electric railroad work. It is hoped that the facilities for laboratory work will be much better than those for last year, although the delivery of the additional apparatus ordered is not so rapid as could be wished. . . .

Course VII. Biology.—The most striking feature of the year in this department has been its productiveness in research and publication. . . .

The staff of this department has been enlarged and strengthened by the appointment of George W. Field, Ph.D., as Instructor in Economic Biology. Dr. Field is a graduate of Brown University and of Johns Hopkins University

and was, not long before his appointment, Assistant Professor at Brown University and Biologist to the Rhode Island Agricultural Station. . . .

Course VIII. Physics.— It is worthy of note that all the experimental work in connection with the proposed Insurance Engineering Experiment Station has been carried on in the Rogers Laboratory, and it is hoped that this arrangement may continue until the new station is completed.

For the Option in Electro-Chemistry eighteen students have registered this year, of whom four are graduates of other colleges,— a result which indicates an even greater demand for a course of this character than was anticipated. . . .

Course IX. General Studies.— The most important event in the work of the English Department during the year has been the development and extension of the idea of co-operation with other courses in the third and fourth years. Before this year from the Course in Mining Engineering have been received technical memoirs and from the Course in Architecture architectural studies. These, after having been examined in the several departments to which they belong, come to the English Department for criticism on clearness and effectiveness of expression. The principle is now extended, in various forms, to the Courses in Mechanical Engineering, Chemistry, Electrical Engineering, Physics, and Sanitary Engineering. . . .

Course XII. Geology.— Owing to the resignation of Professor Niles and the retirement of Professor Barton from all instruction excepting that given to students of Boston University, there has been a general redistribution of the work of the department, which is now being carried on under the general direction of Professor Crosby, with the co-operation of members of the Geological Department of Harvard University, who have given courses as follows: —

Dr. T. A. Jaggar, Jr., in General Geology, Experimental Geology, and Field Geology.

Professor N. S. Shaler, in General Geology.

Professor W. M. Davis and Mr. M. A. Read, in Physiography.

Professor R. De C. Ward and Mr. F. M. Wilder, in Climatology.

Professor J. B. Woodworth, in Glaciology. . . .

Course XIII. Naval Architecture.— In accordance with the decision of the United States Navy Department, mentioned in the report of last year, to send its cadets to the Institute for special instruction in naval architecture, four additional cadets were detailed here for the present year. . . .

The establishment of the course for cadets and the consequent strengthening of the department make it possible to offer a graduate course in naval

architecture, open to all students properly qualified, in which provision will be made for the study of warship design and cognate problems. . . .

Mathematics.— Since Professor Tyler's appointment as head of the department, he has endeavored to initiate, and to some extent to carry out, the following lines of policy : —

An examination of the mathematical preparation which can be secured from secondary schools ;

The determination of the kind and amount of mathematical training required by the professional departments;

The better adaptation of the undergraduate courses to the work of the schools, on the one hand, and to that of the professional departments, on the other;

The development of mutually helpful relations among members of the department by frequent conferences, not only in regard to mathematical instruction, but in regard to subjects of general mathematical interest.

The department has been strengthened by the appointment of two additional instructors. . . .

Modern Languages.— Three courses are now being given in Spanish, for the benefit of the Naval Cadets of Course XIII., and it may seem desirable that this instruction be augmented, next year, by additional exercises in conversation, preferably under the direction of a native teacher. . . .

Libraries.— The total number of additions to the Libraries during the year 1901–1902 was 3,872, of which 1,406 were by purchase, 961 from the bindery, and 1,505 were gifts. After deducting books counted twice, etc., the total net increase in the size of the library amounts to 3,309 volumes, 403 pamphlets, and 136 maps. . . .

Statistics.—The catalogue of this year shows the number of instructors of all grades to be 165, inclusive of those concerned with the mechanic arts, but exclusive of those who are announced as lecturers for the year only. The addition of these raises the total to 183. . . .

Forty-one States of the Union and one Territory, besides the District of Columbia and Porto Rico, are represented on our list of students. Of the total number of 1,608, 935 are from Massachusetts, or 58 per cent. of the whole ; 164 are from other New England States ; 509 are from outside New England. Of these, 47 are from foreign countries. . . .

It appears that the average age on entrance is eighteen years and ten months. . . .

The special students this year constitute twenty-eight per cent. of the whole body, as against twenty-nine per cent. last year and twenty-seven per cent. the year before. . . .

The number of students who are graduates of this and other institutions is one hundred and sixty-one. Of these, twelve are candidates for advanced degrees, ten being our own graduates. . . .

The number of women pursuing courses with us is sixty-three. Of these four are graduates of colleges. . . .

The Society of Arts.— Fourteen meetings have been held with an average attendance of two hundred and sixteen. During the last three years there has been a steady gain in the attendance, which has reached this year three times that of any corresponding period since 1875. Another feature, most gratifying to the Executive Committee, is the increased interest manifested by the students of the Institute in these meetings. . . .

At the beginning of the year the associate membership was three hundred and fifty-four. Of these members one has died, five have resigned, one has been cancelled, and twenty-two have been elected, making the present membership three hundred and sixty-nine. There are thirty-eight Associate life members. . . .

At the October meeting, 1902, the resignation of Mr. Wendell was received, and Mr. James F. Norris was elected secretary. . . .

Treasurer's Report.—This year there has again been a large increase in the amount received from students' fees, the total being more than $31,000 greater than a year ago; but with the increase in the number of students has come a corresponding growth in the expenses, so that the excess of current expenses over receipts is $5,892.14. A year ago such excess was $9,590.26. In other words, the total increase in receipts for current expenses has been somewhat over $35,000, and the increase in expenses between $31,000 and $32,000 over those of a year ago, making the annual deficit nearly $4,000 less.

A triangular piece of land containing about forty-six hundred square feet, and adjoining that previously owned on Stanhope Street, has been purchased in order to bring the front of our land to the future line of Clarendon Street extended. . . .

The following legacies and gifts have been received: —

From Samuel Cabot, Esq., $20,000 to be applied toward the purchase of the Brookline land.

From A. Lawrence Lowell, Esq., and Percival Lowell, Esq., from each $10,000 toward the erection of the Augustus Lowell Laboratory of Electrical Engineering, and from Mrs. W. Scott Fitz $2,000 for the same object.

From the Robert C. Billings estate an additional sum of $7,500, being the amount of the United States inheritance tax returned by the government.

From G. W. Armstrong, Esq., in memory of his son George Robert Armstrong, $5,000, to be known as the George Robert Armstrong Fund.

From an unnamed donor, through President Pritchett, $5,000 to be used "in experiments with a view of finding out the cheapest and most efficacious way of purifying sewage before it is poured into the rivers and harbors of our country." The giver of this promises an equal amount yearly for two more years, for similar purposes.

From Arthur T. Lyman, Esq., $5,000 for general purposes.

From a friend, through Francis H. Williams, M.D., $1,000 for experiments in the use of the Roentgen-rays.

From the estate of the late Henry L. Pierce, an additional sum of $3,000.

From the estate of the late Susan E. Dorr, an additional sum of $1,956.63.

From the estate of the late Matilda Goddard, $500.

From the Saturday Club, for the purchase of books, $500.

From a friend, for salary account, $500.

From Mrs. William B. Rogers, for the purchase of periodicals, $200.

From Samuel Cabot, Esq., for prizes for designs for medal to be given for improvement in physical development, $25.

The gifts and bequests during the past year to be added to the funds for special purposes amount to $46,951.05, and to the funds for general purposes to $21,000. These figures do not include the money given for sewage experiments and for Roentgen-ray investigation, nor $1,225 given to be used during the past year.

The total increase in the funds of the Institute for this year has been $96,524.18, including $26,558.97 cash belonging to the Walker Memorial Fund. . . .

ABSTRACT OF REPORT ON ENGINEERING LABORATORIES OF FOREIGN TECHNICAL SCHOOLS, BY PROFESSOR EDWARD F. MILLER

During the past summer it was the good fortune of the writer to be commissioned by the President and Corporation of the Massachusetts Institute of Technology to visit the most important technical schools of England, Germany, Switzerland, and France, in order to report on their methods of laboratory instruction and on their laboratory equipment.

It was found in most of the leading technical schools that the method of instruction in the laboratories was the same as that in use at the Institute. In a number of places the professor in charge said that the system was copied directly from that of our school.

Concerning the equipment of the steam, hydraulic, and metal testing laboratories, classed by us as Engineering Laboratories, it may be said that, of all the schools visited in England, but one, that of the New Technical School at Manchester, would compare favorably with ours.

The equipment of the French and of the Belgian schools was very meagre. That of the German and Swiss schools was in many cases equal to, and in some cases, notably Charlottenburg, Dresden, and Zürich, superior to ours in some branches. In a few of the smaller schools some certain branch of the Engineering Laboratory work has been so well developed that it is possible to obtain there a better course along that special line than can be obtained at the larger schools. This condition is, no doubt, due to the fact that each particular branch of laboratory work is under a separate head; and, as a consequence, that branch of the laboratory is most developed which has the most able professor as its chief.

This same fact often leads to jealousies among the professors, and prevents the advancement of the laboratory as a whole.

The system of laboratory management at our Institute is on another, entirely different basis. Here the instructor in charge receives and acts on suggestions given by the Professors of Hydraulics, of Steam and of Applied Mechanics.

The following laboratories visited are described in considerable detail in the original report, but limitation of space forbids the publication of any except the most striking facts.

Glasgow University.

Glasgow and West of Scotland Technical College.— This college has altogether about 4,500 students. The classes are mostly evening classes.

New Technical School at Manchester.— This school is supported by the citizens of Manchester. Its laboratories are the best to be found in Great Britain.

Old Technical School at Manchester.

Owens College at Manchester.

Royal Technical Institute at Salford.— Boys thirteen to fifteen years of age are trained here in the Mechanic Arts and in the simpler methods of testing dynamos, engines, steel, wire, etc.

Victoria University, Liverpool.— A new building, to be devoted to engineering work, is now in process of construction. At present there are one hundred and twenty engineering students who take a three years' course.

The Municipal Technical School of Liverpool.— A person visiting this

school is impressed with the magnificence of the building and its furnishings. There are about four thousand students attending the school, all in evening classes. The cost is two cents per lecture, or sixty-three cents for eight months' evening work. Plumbing, book-binding, masonry, painting, printing, decorating, and elementary engineering are taught.

University College of London (*Gower Street*).— The work of the school is similar to that of the Municipal Technical School at Liverpool. The course is supposed to cover a period of two years, but the attendance is very irregular. No entrance examinations are held, and no degrees given.

City and Guilds of London Institute Central Technical College.

Hannover, Kgl. Technische Hochschule.

Berlin, Koenigliches Technische Hochschule.— Through the courtesy of Professor Goering, to whom the writer was introduced by Professor George F. Swain (a former student of Professor Goering's), every opportunity was given to see the work of the school at its best advantage. Invitations were also received to the inaugural exercises of the new director, who is chosen from the faculty, by the faculty, to serve for a period of one year. The new director, in his address, remarked that "the German need fear in the industrial world neither the Englishman nor the Frenchman, only the American; and that, to compete with the American engineer, they must strive constantly to improve and extend their engineering courses." Some of the laboratories here are, without doubt, the largest and best equipped of any in the world. One is especially impressed with the magnitude and scope of the testing laboratories, which are used primarily for government work and for commercial testing, the instruction of students being considered of secondary importance. These laboratories are soon to be moved into much larger quarters, ten miles out of the city.

Dresden, Koenigliches Hochschule.— But little government or commercial work is done here; and the ordinary student would, no doubt, get more personal instruction from the professor than he would at the other school, as here the laboratories are primarily for students' use.

München, Technische Hochschule.— There is a greater number of students here than can be conveniently accommodated in the laboratories, the number being between eleven hundred and twelve hundred.

Stuttgart, Koenigliches Technische Hochschule.— Each student taking engineering is supposed to work ninety-six hours in the steam, hydraulic, and gas laboratories. During the past year sixty men took this course.

Carlsruhe, Kgl. Techn. Hochschule.

Darmstadt, Grossh. Techn. Hochschule.

Zürich, Polytechnicum.— The cement laboratory is finely fitted up; and a large force of men are employed in this branch, which includes also the making of brick and tiles, and baking the same.

Aachen, Université.— The laboratories accommodate three hundred students, the total working time assigned to each one being two hundred hours.

Liège, Université.

Paris, Conservatoire des Arts et Métiers.— This school has no laboratory at the present time; but a two-story building, 270 feet by 50 feet, is being erected to be used as such.

Paris, École des Ponts et Chaussées.— Students visit these laboratories but twice a year. The entire work is practically for the government. 90 per cent. of the time given to government work is devoted to work on cement, the rest to metal testing and other work of the same nature. Besides the work which they do in the laboratory, the engineers employed here are given the right by the government to experiment on any structures made of cement or concrete in process of erection in Paris. Much useful information is obtained by this means.

Paris, Government Testing Laboratory (Artillery).

Boulogne-sur-Mer, École des Ponts et Chaussées, Ciment Laboratoire.

To sum up briefly, it may be said that, with the exception of the New Technical School at Manchester, the English and Scottish schools were found to have but little in the way of laboratory equipment. In addition to this many of them have not kept pace with the times, as was seen most plainly in their material testing laboratories. This stagnant condition is probably due in large measure to the following: interference in the courses of study by parties outside of the faculties of the schools: to the fact that many of the professors who are advanced in years have not kept up with modern practice, as a result of which they are teaching the practice of twenty years ago; and to the small amount of work given to the school by the most capable of the professors, their time in many instances being almost entirely devoted to outside practice. It is not infrequent for the professor's assistant to give regularly lectures of his chief.

The New Technical School at Manchester proved nearest akin to our American technical schools, its mechanical course, which is under the direction of Professor Nicholson, formerly of McGill University, being professedly based on American ideas.

The French schools have nothing to attract or to interest an American engineer.

The Belgian schools are on a par with the English schools.

The equipment of the larger German schools and the Swiss schools at Zürich are, on the whole, superior to the greater part of our American technical schools. These schools have well-equipped laboratories, and in many cases are carrying on investigations of great value to the engineering public.

A nnmber of the schools, even some of the smaller ones, have cement laboratories and gas laboratories superior to ours at the Institute.

The metal testing laboratories of the larger schools have testing machines in greater numbers and of greater variety than we have. Investigations of the fatigue of metals and of the effect of shock or impact are being carried on in a number of schools : here but little is being done in these lines.

The German professors keep thoroughly posted as to what is being done in the leading American schools, and are quick to take advantage of and to profit by any new ideas.

A number of large power stations and industrial establishments in Scotland, England, France, and Germany, were visited, as well as the Ausstellung at Düsseldorf. It was found that in the modern power stations steam superheated 300 F. was in quite general use, that mechanical stokers were giving place to hand-firing, that practically nothing is being done to prevent smoke or to consume the smoke, that the gas engine is used to a greater extent and in much larger units than with us.

The writer desires to express his thanks to Mr. Andrew Robertson, M. I. T. '02, of Watson, Laidlaw & Co., Glasgow ; to Mr. Robert S. Ball, M. I. T. '91, consulting engineer, London, England ; to Mr. William S. Hulse, M. I. T. '94, electrical engineer with Union Electricitäts-gesellschaft, Berlin, Germany ; to his classmate, Mr. Alexander Garfield, M. I. T. '86, electrical engineer and consulting engineer for the Thomson-Houston Company, Paris, France ; and to others for courtesies extended him.

THE UNDERGRADUATES

TECH SHOW

"A Scientific King," the show to be given by the students this year, is a comic opera in two acts which carries with it a "Technical" atmosphere. The boys have not tried to produce a play requiring very heavy acting, but an interesting little comedy, which sparkles with bright, catchy music, witty dialogues, and local hits.

For the first time since the theatrical organization at Tech the play will be entirely the work of the students. The music is the united efforts of four men, L. C. Whipple, '04, G. F. Loughlin, '03, William J. Bay, '03, and Frank S. Farrell, and is considered by many who have heard it equal to any that has been produced in comic opera in Boston this year. The plot of the book is written by Mr. G. F. Loughlin, and affords opportunities for a host of amusing situations and dialogues.

The first scene opens on the mythical island of Metasilicasia, ruled over by King Albite, who is a very devoted scientist. Much to his sorrow, his subjects as well as his heir, the Prince Phyllite, have no sympathy with him in his researches. In order to train his son to reign according to his peculiar scientific methods, he resolves to abdicate in his favor. The people hail with delight the advent of the new king, whose coronation day will also be that of his marriage to the lovely Princess Margarite. A party of Tech Co-eds arrive most inauspiciously at this juncture on a wonderful flying machine, a Tech invention; and the king conceives the unfortunate idea of breaking off the young prince's happy engagement, sending him to Tech for four long years, and afterwards marrying him to Polly Con, one of these enterprising Tech Co-eds, thus securing a scientific queen for the island.

Fortunately for the lovers, they have a strong sympathizer and supporter in the king's niece, Beryl, who, when she hears of the monarch's decision, goes for help to Topaz, a robber chief who is in love with her. He appeals to Mercury for aid, and the kindly god sends the spirits of the valiant Dick Turpin, Captain Kidd, Robin Hood, and Roderick D'hu to earth to help them.

The robbers surprise the king and courtiers, and demand their surrender. They refuse, when the spirits of the brave old robbers sent by Mercury

appearing on a rock in the distance so terrify the king's force that they offer no resistance to Topaz, who rushes in and carries off the young prince.

The second act finds the court mourning the capture of Phyllite. The palace is turned into a sort of Massachusetts Institute of Technology under the direction of the learned Co-eds, who, with their wonderful scientific machines and methods, are certain of their ability to rescue the prince. Unfortunately for them, they do not recognize the robbers disguised as janitors in the palace, who, of course, overhear all their plans for the scientific rescue. These robber janitors overpower the Co-eds, capture the Royal Secretary, and force him to sign papers which will annul the king's former decree and permit Prince Phyllite to secure the throne and marry his beloved princess. Polly Con is wooed and won by the Royal Secretary, and the Scientific King is forced to agree to all the conditions imposed by his very unscientific subjects.

There are at least twelve catchy airs in the opera. The opening chorus, the Co-eds' song, "Some love I'm waiting," "Tale of the Electric Bell," and "Waltz Blanette" are especially worth mentioning. The airs of the Robbers' Chorus and the Janitors' Chorus are very taking.

In selecting the cast this year, it was not a question of how much material have we, but how to weed it out; for the coaches had to turn away many promising applicants for places. Never before have the boys turned out in such numbers, and many were disappointed in not getting a speaking part. The cast has all been assigned, and is as follows: —

King Albite	Joseph Daniels
Prince Phyllite	F. L. Higgins
Princess Margarite	T. W. Estabrook
Princess Beryl (King's Niece)	R. J. King
Willemite, Royal Secretary	Roswell Davis
Topaz, Robber Chief	J. P. Barnes
Lepidomelane, Lieutenants	W. J. Sneeringer, Jr.
Psilomelane, Lieutenants	A. H. Langley
Polly Con, Leader of Co-eds	U. J. Nicholas
Pedro, Inn Keeper	F. M. Blount
Jasper, Bell Boy	H. W. Donald
Arlo Simpkins	E. M. Coffin
Miss Deal Chaperon	Gorham Crosby

The sale of seats for the play this year has been unprecedented. There were over five hundred applications filed, one hundred and fifty of which were

unable to get anything for the Friday performance. For the Tuesday's performance the sale is far in advance of last year, and even at this early date only a very few poor seats are left in the first balcony. The management this year showed ability in the impartial way in which it assigned seats. Even the members themselves took their places in line with the other students.

Praise is due the management who have worked on this year's production untiringly. Mr. M. L. Emerson, the general manager, was a member of last year's board when "Applied Mechanics" was produced. He has had extended business experience, and is running the play to make it a financial success. The other members of the board are R. A. Wentworth, '04, business manager; S. C. Runnels, '05, assistant business manager; W. W. Cronin, '04, stage manager; G. C. Thomas, '05, assistant stage manager; A. E. Rippey, '05, press representative.

ATTWOOD E. RIPPEY, '05.

PROFESSIONAL SOCIETIES

A. I. E. E. A. and E. E. S. Meetings.— The first joint meeting of the American Institute of Electrical Engineers and the M. I. T. Electrical Engineering Society was held at the Tech Union, February 13. All the officers of the national professional society were present, and many spoke.

The societies are planning monthly joint meetings; and an Executive Committee, consisting of Dr. Louis Duncan, Professor Harry E. Clifford, Messrs. J. W. Welsh, K. W. Endres, and R. W. Eaton, is in charge.

The second joint meeting was held March 26, at the Union, with Dr. Louis Duncan presiding. The first business was the election of the officers of these joint meetings, which resulted as follows: chairman, Mr. C. L. Edgar, 70 State Street, Boston; secretary, Mr. R. W. Eaton, '03; Executive Committee, C. L. Edgar, J. W. Welsh, Dr. Louis Duncan, Dr. A. E. Kennelly, and Charles Burleigh.

Mr. James F. McElroy, consulting engineer with the Consolidated Car Heating Company, presented a paper on a new system of axle lighting,— a recent invention of his own.

Chemical Society.— The first smoker of the new Chemical So-

ciety was held at the Tech Union, January 8. The second regular meeting was held at the Union, March 23, about forty members being present. A short business meeting was first held, at which an amendment to the constitution, admitting graduate students to membership, was adopted. Several honorary members were elected. The third smoker was held March 30, Dr. Thorp and Mr. A. D. Smith, '04, being the speakers of the evening.

Naval Architectural Society.— The Naval Architectural Society held a smoker at the Tech Union on February 24. The following officers were elected for the coming year: president, George H. Powell; vice-president, Calvin P. Bascom; secretary, Charles L. Steinrok; and treasurer, Austin Y. Hoy.

Architectural Society.— Mr. Clarence H. Blackall, architect, addressed the members of the Architectural Society at a smoke talk held February 16, at the Tech Union, on the Colonial Theatre.

At the last business meeting of the society, Mr. I. R. Adams spoke on "The Evolution of the Student in Architecture during his Sophomore, Junior, and Senior Years." Mr. Adams developed his subject along the lines of general culture, and substantiated his remarks by means of statistics which he had himself compiled.

Mechanical Engineering Society.— February 12, at the Tech Union, Mr. J. C. Riley, '98, talked of his experiments on steam engine governors.

At the annual meeting of the society, officers for the ensuing year were elected as follows: president, E. O. Hiller, '04; vice-president, R. O. Ingram, '04; secretary, A. M. Holcombe, '04; treasurer, W. A. Evans, '04; Executive Committee, E. O. Hiller, R. O. Ingram, W. A. Evans, C. C. Easterbrooks, A. W. Burnham, P. M. Arnold; Programme Committee, Professor Miller, Mr. J. C. Riley, J. F. Ancona, E. W. Charles, W. L. Cronin, E. P. Tripp, and E. Harrah.

At a meeting held by the society on March 11, at the Union, Mr. John A. Stevens gave an interesting talk on "Marine Engine-room Experiences."

The present membership of the society is one hundred and forty.

Mining Engineering Society.— At a meeting of the society held at the Union, February 19, Professor Hoffman spoke on last summer's trip of the Summer School, also on "Copper Smelting in Montana."

Civil Engineering Society.— A smoke talk was delivered by Mr. Edward M. Wheelwright, on the subject of "Bridges: An Architect's Point of View," before the society, at the Tech Union, on January 9.

ATHLETICS.

Annual Indoor Meet.— The Annual Indoor Meet of the Athletic Association was held at the gymnasium, January 16. Summary of events: —

40-YARD DASH — FINALS.—First, Crowell, '04; second, Haynes, '04; third, Williams, '06. Time, 4 4-5 s.

RUNNING HIGH JUMP.— First, Curtis, '04; tied for second, Farrington, '05, Emerson, '05. Height, 5 ft. 7½ in.

35-YARD HURDLES — FINALS.— First, Emerson, '05; second, Ovington, '04; third, Curtis, '04. Time, 5 2-5 s.

PUTTING 16-POUND SHOT.— First, Morrill, '05; second, Winchester, '03; third, Curtis, '04. Distance, 38 ft. 2½ in.

POLE VAULT.— First, Curtis, '04; second, Clay, '06; third, Farrington, '05. Height, 10 ft. 3 in. Curtis's previous record, 9 ft. 11 in.

POTATO RACE —FINALS. — First, Needham, '04; second, Ovington, '04; third, Kendall, '04. Time, 54 2-5 s.

MILITARY RELAY TEAM RACE.— Won by '04. Haynes, Crowell, Flynn, Lang, Ovington, Needham, Kendall, Evans, Kellar, Bee, and Magnitzsky.

SUMMARY OF POINTS.— '03, 3; '04, 32; '05, 15; '06, 4.

B. A. A. Meet.— At the B. A. A. Meet, February 14, in Mechanics' Hall, Tech men entered in six events and won four,— the 40-yard handicap, 40-yard novice, 600-yard run, and the relay race,— and secured second in each of the above open events also. Scoring by points and not counting the relay race, Tech won the meet, securing in all 24 points to Harvard's 20, and N. Y. A. C.'s 14, no other single organization scoring over 5.

The most important, and the most unsatisfactory event for Tech, was the relay race with Bowdoin. In the very first relay, Emerson, for Tech, was fouled by the Bowdoin runner who knocked him off his feet. Nevertheless, Emerson cut down the lead half-way, and the last man finished but two yards behind the Bowdoin man. The decision was awarded to Tech on a foul, the Bowdoin team, who were very sorry for the unintentional foul, making no protest.

N. E. I. A. A. Convention.— The Annual Convention of the New England Intercollegiate Athletic Association was held February 21 at the Copley Square Hotel. Delegates were present from Amherst, Bowdoin, Brown, Dartmouth, Maine, M. I. T., Trinity, Tufts, Wesleyan, and Williams. H. S. Baker and T. E. Jewett were the representatives from Tech. Two amendments were proposed by the M. I. T. Athletic Association; namely, to drop the 2-mile bicycle race from the list of events, and to change the counting of points from 5, 3, and 1 for first, second, and third places, to 5, 3, 2, and 1, for first, second, third, and fourth places. Dropping the bicycle race was opposed by Brown, Wesleyan, Trinity, and Maine, on the ground that it was not fair to those who expected to win points in the bicycle race this spring. As a two-thirds vote is required for an amendment to be made, the proposed amendment was lost by a vote of six in favor to four against it. The proposed change in counting points was unanimously adopted.

Dual Meet.— A Dual Meet with Tufts was held March 4, Tech winning 45 to 21.

Events.	*Tech.*	*Tufts.*
40-Yard Dash	8	3
High Jump	9	2
Hurdles	6	5
Shot Put	6	5
Pole Vault	10	1
Potato Race	6	1
Totals	45	21

Spring Games.— The schedule of games for the spring is as follows: trial games, April 9, 10, and 11; class championship games,

April 24, 25; Dual Meet with Tufts, May 2; Dual Meet with Dartmouth, May 9; and N. E. I. A. A. Meet at Worcester, May 22, 23.

Cross Country Association.— The following officers were elected Tuesday, March 3: president, A. J. Sweet, '04; captain, E. H. Lorenz, '05; chase captain, A. M. Holcombe, '04; secretary, C. R. Haynes, '04; manager, F. B. Riley, '05. March 7, the Association held the first hare and hounds chase of the spring at Chestnut Hill Reservoir.

Fencing.— The Tech Fencing Team was defeated by the Y. M. C. A. in the gym. February 25 by the score of 5 to 4. As this was the first match any of the Tech men had ever entered, and as their opponents were men of over thirty years of age and experienced by years of fencing, the result was exceedingly commendable for Tech.

TECH Y. M. C. A.

On Friday evening, March 13, an informal reception was held at the student house, 240 West Newton Street. Dean Burton and Secretary Mehaffey of the Boston Y. M. C. A. were present. At the regular annual election of officers the following were elected: president, A. W. Bartlett, '04; vice-president, R. N. Whitcomb, '05; secretary, J. R. Sanborn, '04; treasurer, A. W. Richards, '04.

MUSICAL AND OTHER CLUBS

Glee, Banjo, and Mandolin Clubs.— The Tech Musical Clubs gave their annual midwinter concert Wednesday, January 7, in Huntington Hall. Following are this year's officers: Lewis G. Wilson, '03, president; Omar S. Swenson, '03, vice-president; Clark D. Simonds, '04, general manager and treasurer; Charles B. Mayer, '05, secretary; Louis E. Robbe, '05, assistant manager and treasurer. *Glee Club.*— James P. Barnes, '05, leader; Ralph H. Nutter, '03, manager. *Banjo Club.*— R. C. Jackson, '06, leader; Philip S. Sweetser, '04, manager. *Mandolin Club.*— Charles B. Mayer, '05, leader; R. Hazeltine, '04, manager.

The annual spring concert and dance of the Musical Clubs will be held in the New Century Building, 177 Huntington Avenue, Wednesday evening, April 29.

The Chess Club.— On March 6 the following officers were elected: president, G. Hill, '04; vice-president and business manager, W. I. Lowrie, '06; secretary and treasurer, M. Cline, '05; Executive Committee, P. S. Crowell, '05, H. M. Edmunds, '05.

W. I. Lowrie beat Mr. Lasker, the world's champion chess player, Thursday, February 5, in a short game of 33 moves. Mr. Lowrie graduated from the English High School, and is a member of the Boston Chess Club.

The Walker Club.— The club held a dinner at the Tech Union on March 6. After dinner, Alfred Peabody gave a talk on "Australia."

The Exeter Club.— On Thursday, February 26, the club held a dinner at the Tech Union.

CADET DRILLS

Freshman Drill.— On the second Wednesday preceding the Interscholastic Drill there will be held a company and individual drill among the members of the Freshman Battalion. In this drill the men will be divided into two squads, a Junior squad and a Senior squad, for those who have never drilled before entering the Institute and for those who have had previous training. Winners in each squad will be given medals for their excellence.

Interscholastic Drill.— An interscholastic individual drill will be held under the auspices of the M. I. T. Corps of Cadets, Friday, May 8, at 7.30 P.M. The drill will be held at the South Armory, Irvington Street, Boston. General admission will be fifty cents.

GENERAL NOTES

Withdrawals.— Although this year's entering class surpasses all predecessors in size, the number who were requested to withdraw with the beginning of the second term is far below that of any former class.

Class Day Officers.— The election of the 1903 Class Day officers occurred March 28, with the following results: first marshal, Horace S. Baker, I.; second marshal, Howard S. Morse, I.; third marshal, Paul R. Parker, XIII.; orator, Richard C. Tolman, X.; statistician, John F. Ancona, II.; poet, George H. Clark, VI.; prophet, Walter M. Drury, III.; and historian, Galen M. Harris, II.

The fifteen members of the Class Day Committee elected from the class at large are: L. H. Underwood, III., chairman; L. W. Adams, II., H. S. Baker, I., J. T. Cheney, II., H. Crosby, XIII., W. M. Drury, III., G. M. Harris, II., L. H. Lee, VI., H. S. Morse, I., R. R. Newman, I., R. H. Nutter, II., P. R. Parker, XIII., J. L. Lyon, II., G. W. Swett, II., and G. B. Wood, II.

Course VI., Journal Meetings.— There have been inaugurated this year in the Department of Electrical Engineering regular meetings of the Senior students, in which abstracts of important papers in the current electrical literature are presented by the students and the papers are then discussed by members of the instructing staff of the department.

Forging.— On March 19 the classes in forging took their regular trip to the forges of the city under the direction of Mr. Lambirth. The party first visited the Lockwood machine shop, where the foreman of the works showed the men the entire process of converting the scrap iron into finished car axles. Finally, the East Boston forge was visited.

Technique.— The competition for the cover design of the 1904 *Technique* was won by I. P. Lord, '04.

INFORMAL ADDRESS BY LUCIUS TUTTLE, ESQ., PRESIDENT OF THE BOSTON & MAINE R.R., FEB. 13, 1903

Men of Technology, your President suggested to me, about a couple of weeks ago, that I come before you this afternoon and take, perhaps, fifteen or twenty minutes, and that I talk upon practical matters as I might consider them of use to the young men who are beginning life in the Institute. He cautioned me that an oration would not be expected; but that need not have been said, because I cannot make an oration. If I can talk, that will be all that I can expect; and I shall hope to interest you in a few things, none of which are new,

but which perhaps may be suggested to you in a new dress, so that they may be of greater use than they have been in their old dress and in a somewhat crowded and unknown condition.

Probably every man in this Institute, and every person within the sound of my voice who is beginning, or who has begun, to study, thinks he is undergoing a preparatory experience, and that, when he gets out of this Institute, the preparatory age will be over, and he will go immediately into the perfected condition. There is no greater mistake in the world. No man who is worth anything ends the preparatory career of his life until his life ends and his record is made. This may be a preliminary period of your life,— it is formative, it is preparatory,— but it will continue to be preparatory just so long as you continue to be of use in the world, to yourself and to others. You are to be the moulders of thought — the makers of things material, in a large way — in the matters that are going to concern the next generation of useful men and useful women in the world. Your responsibilities, therefore, are great; and it lies with each one to assume his responsibility, to make the best of it. And how shall it be done? I know how easy it is to give advice: I have had a lot of it. I know how difficult it is to take it and assimilate it. I shall endeavor to refrain from giving advice. I shall only speak of a few things, in the time at my command, that seem to be practical, and not specially from my own personal experience, but from observation of the experiences of others in a pretty active business career, extending over the best part of my life.

In the first place, I would recommend to every man who intends to be any thing in the world, intends to accomplish something in the world worth accomplishing, that he become methodical in his habits, that he find out as well as he can what he intends to do, and then have a method about every part, not be fanciful, not to-day to have one idea and to-morrow another and next week another, not to put the hand to the plough and then to turn backward. Be methodical in so far as you can. Determine what you intend to do, and then be methodical in carrying out your plans; and, when you get to the point of doing it, you will find that having a method will fix yourself in the habit, and it will help you almost more than anything else to accomplish your plans. Method! Distribution of your time! Do at certain times certain things and finish them, and take another thing and finish it, and you will find that you will use most of your time economically. It is a well-known fact that, if you want something done well, and done promptly, you want to find the busiest man in town, and he will do it for you. The business man who is methodical and practical will find the time somehow to take care of this particular thing and do it well. So, I say, as a corner-stone in forming life's business habits, be methodical, practical.

I really don't feel that there is much necessity for me to speak upon the next thing I had in mind, but I am going to venture to intrude this thought.

As a boy, as a man, and all through life, nothing will be of more essential benefit than the habit of personal cleanliness as leading to moral cleanliness. The young man, or the old man, or the middle-aged man, who is given responsibilities, and is expected to be in touch with the rest of mankind, cannot do anything that will make him more useful and more attractive than this habit of personal cleanliness in his attention to his person and his dress, and everything that pleases those with whom he associates. When you see a boy coming into the office with his finger-nails defiled with a crescent of black, and his front teeth yellow for lack of a tooth-brush, and his shoes a little run down at the heel, and his waistcoat with a button missing here and there, and a plentiful supply of food in the place of it, unkempt hair or untrimmed, and that boy is seeking for his place in the world, in a business office as engineer, as anything you please, he handicaps himself. He may be the ablest, he may be the best; but, when he presents himself to the man who is to decide his case, he has deliberately handicapped himself. I heard a story which illustrates a Southern boy's opinion about that. Dr. Frissell had to put up in a cabin at one time. He wanted to know where he should wash. A boy took him out to a brook. Dr. Frissell took out his brush and comb, tooth-brush and blacking-brush. The boy said, "Dr. Frissell, do you do that every morning?" "Why, yes," he replied. "Well," said the boy, "you must be a great trouble to yourself."

The ambition of every one is to get wealth. Every person desires wealth, and it is proper that he should. It is a proper incentive. Wealth gives personal enjoyment, enables the distribution of much comfort to others. The accumulation of wealth is laudable, if it is accumulated for proper purposes. If a man accumulates money in the proper way, and uses it properly, you have results like this great gathering here; you have technology institutions; you have colleges; you have hospitals; you have the things which make life worth living. So it is a laudable ambition to accumulate wealth, not for the sake of having, but for the sake of using it.

You will be called upon to employ others, and I think it is a most fortunate thing that there are not many in this room who are rich. I know, if I had had wealth at my disposal, I should have been tempted, when a small boy, sometimes to put my fingers to my nose, and tell my employer to go to blazes. A boy who has an accumulation of money left him by his ancestors is handicapped by the fact that he cannot submit as he ought to submit until he is big enough to make another man submit. You will be employers. Watch the young man in your employ, and give him the second chance or the third, if he is worth it, and make sure before you drop him that he is not worth it. There's many a man today standing on the highest pinnacle of his success who shudders at the narrow escapes he had in his early days, and thanks the man who gave him another chance. Give those who come under you, to the fullest extent of their merits, the second and the third chance before you wreck their lives.

Cultivate the habit of observation and induction. The men who have the least patience are those who take everything for granted, and never inquire why. Whenever you see anything out of the ordinary, try to find out for yourselves why it is so. Stimulate the mental capacity in that direction. Learn things of yourselves: go quietly and hunt up the reason without asking a lot of people. It stimulates the mental capacity, and that will often help you to decide questions that would have made you stagger if they had been given you five years ago. Induction comes from observation. Deduction comes from observation. Learn to know things for yourselves, each for himself, and you will find that of immense value as you go on in life. Then decision of character,— decide for yourself, learn how. You cannot tell another person what he ought to do under certain circumstances, neither can he tell you. It is proper to talk things over with some one who has had greater experience; but, after all, the decision of every vital matter you have got to make, and stand the result. You cannot do that until you cultivate the habit of weighing the one point with another, and summing it up; and, if you get to the point where you can decide these questions for yourself and then abide by the decision, and say, "I am going to work it out along that line," the chance of success to failure will be a hundred to one, and the chances of failure, the other way, will be a hundred to one.

Now, if to-morrow you expect to be something higher than you are to-day, and next year to be something more than you are to-day, there is just one rule for you,— do in the very best possible way the things that are committed to your charge this moment. A young man said to me the other day that he believed the element of success in these crowded times was to get the attention of some Morgan or Rockefeller, and, if he got that, he was fixed. He never made a greater mistake than that. If he can show a Morgan or a Rockefeller that he has got something that Morgan or Rockefeller needs, he can establish a mark for that. The man who establishes the value of something is the man who gets the attention of the wealthy man; and then, if he can show that he is capable of doing more and more and more, his success is assured.

Of course, it is unnecessary for me to say that no man who intends to be in touch with the world ought to omit every opportunity to read good books,— not everything. He may read light books for variation, recreation, but read *good* things, and read only the best. Take time enough from the other duties of life to get some variation from the monotony. You will find on the pages of literature the ideas of successful men and successful writers, which will help you tremendously to be a manager of the human problem. The human problem is the one which will confront every one in this life. It is the management of men, it is the management of brains, it is the controlling and moulding of men and their ideas; and you cannot broaden your own ideas better than by finding out what other men have thought on that subject, and what they have done with it in the seven or eight hundred years of written history. Therefore,

I say, don't omit your opportunity to read good literature, and a little of it every day.

Now, at the end of my preachment, never forget to be a manly man and a womanly woman. Cultivate honesty, rugged honesty, integrity, square dealing, manliness, toeing the mark in every emergency, and be willing to admit that you are in the wrong, if you are wrong. Being willing to stand up under the things which you have undertaken to do and failed will help you more against the next failure than anything else in the world. Be manly, be dignified, be upright, be truthful, and remember that there is nothing which aggrandizes so easily as the human being. It absorbs the bad, I am sorry to say, more easily than the good. Aggrandize the right thing with honesty and integrity, and you will stand without failure; and you will each take in your own place that comparative success which is the only success (there is no real success, everything is comparative),— that comparative success which will have warranted all that you have put in, and will have warranted your being on earth.

THE GRADUATES

NORTH-WESTERN ASSOCIATION OF THE M. I. T.

The sixteenth annual banquet of the Association was held in the Banquet Hall at "Kinsley's," 105 Adams Street, Chicago, Saturday evening, Feb. 21, 1903. The theme of the evening was "The Effect of Applied Science on American Progress." Mr. James J. Hill, president of the Great Northern Railroad, who was to have made an address on the subject of "Transportation," was kept away by illness.

To quote from the *Tech Bulletin* for March: —

If you weren't at the last annual banquet, you missed a mighty interesting time and lots of good fun. President Pritchett, contrary to the doctor's orders, was with us, and gave us one of the best talks we have yet had, his subject being "Effect of Applied Science on America's Progress." After going over the various possibilities of the different commercial nations, he said that the race for supremacy narrowed down to two countries, America and Germany. He especially called attention to the necessity of educating not only the engineer, but also the artisan, the mechanic, and the laborer, giving them the advantage of technical training.

I. W. Litchfield, '85, expressed his remarks on the same subject in a humorous (?) poem, which was fully up to our friend Ike's standard, and was loudly applauded.

President T. W. Robinson, '84, in introducing the speakers, called attention to the very rapid increase in efficiency of production, due to modern labor-saving machinery, and to the important part that this was playing in our struggle for industrial supremacy.

Professor George E. Hale, director of the Yerkes Observatory, Lake Geneva, outlined the plans of the removal of the Institute to more commodious quarters in some suburb of Boston; and this was expanded upon by Dr. Pritchett.

This covered the serious part of the programme; but, to appreciate the fun we had, you had to be there. One thing that brought forth much amusement, as well as good feeling, was the rising of each member in turn, giving his name, class, residence, and the number of his own boys he was to send to Tech and the number of girls he wasn't to send. Clark will send eighty-two girls and one boy. Ask him.

At the business meeting preceding the banquet the following were elected Executive Committee for the ensuing year: president, Solomon Sturges, '87; vice-president, Mortimer Frank, '97; secretary, V. R. Lansingh, '98; Durand Churchill, '98; R. K. Sheppard, '95; E. H. Huxley, '95.

Quoting again from the *Bulletin*: —

The next meeting will be on March 31, at 6.30 P.M., at the Hamilton Club, corner of Clark and Monroe Streets. Professor F. J. Walz, inspector of United States Weather Bureau, will give us a talk on "Growth and Operation of the United States Weather Bureau," illustrated with diagrams, instruments, and anecdotes. Mr. Henry J. Furber, Jr., president Olympian Games Association, will also be present, and will talk on "Americans at the Universities of France."

The next meeting after that of March 31 will be held in May, the programme for which will be announced later.

The June meeting will be decidedly out of the ordinary, as our president, Mr. Sturges, has asked us all out to the Onwentsia Club. Those who wish will go out with their golf clubs early in the day to "chase the quinine pill," to enjoy the other privileges of this, the finest of all the country clubs around Chicago. Then we will have our meeting with the speakers about supper-time, with good entertainments and lots of fun, returning to Chicago later in the evening.

V. R. LANSINGH, '98, *Secretary*,
18 E. Adams St., Chicago, Ill.

THE TECHNOLOGY CLUB OF NEW YORK

The January meeting was held at Hotel Hungaria, 4 Union Square. There were thirty-seven present. After dinner the 18th Street Central Station of the New York Telephone Company was visited. After a talk on Telephone Installation by J. L. Wayne, '96, the members were conducted through the station in parties by Wayne, '96; Tilly, '96; McGowan, '00; Keith, '00; and Stickney, '96.

The eighth annual meeting and dinner were held in the Council Chamber of the University Club-house. There were seventy-five present, Walter Large, '79, presiding. The guests were President

Pritchett, President Humphreys of Stevens, Rev. W. E. Clifton Smith, formerly of Dorchester, Mass., and F. A. Vanderlip, Esq. President Pritchett gave a most interesting talk, in which he spoke of the changes in the Faculty and the courses of study, the new Lowell Laboratory, the proposed School of Engineering Research, and the removal of the Institute to the suburbs. After the meeting the members were shown through the University Club House, unquestionably the finest in the world. But not as a possibility for their own proposed club-house,— at least not for the near future.

The following have been elected to membership, making a total of 159: Myles Standish, '68; F. T. Sargent, '75; A. M. Waitt, '79; T. H. Randall, '84; R. S. Clemons, '89; L. A. Ford, '89; S. Schieffelin, '90; J. H. Freedlander, '91; G. H. May, '92; R. F. Tucker, '92; W. V. Brown, '94; W. D. McJennett, '94; J. H. Gregory, '95; J. A. Gurd, '95; W. J. Rice, '95; A. Chittenden, '96; S. A. Crane, '96; J. F. Gaylor, '96; T. I. Jones, '96; W. Binley, '97; C. Ewing, '97; C. G. Wing, '97; F. F. Colcord, '98; E. T. Foulkes, '98; H. K. White, '99; E. H. Davis, '00; C. H. Hapgood, '00; G. G. Heghinian, '00; L. A. Oliver, '00; C. Van Merrick, '00; M. B. Foster, '01; F. Mathesius, '01; F. W. Puckey, '01; and W. S. Read, '01.

Announcements.— Monthly meetings are held the first Saturday of February, July, August, and September; other months, on the tenth. Club-house to be opened in the fall, in which there are to be rooms for twenty members.

Alex. Rice McKim, '85, *Secretary*,
106 E 23rd. St., N.Y. City.

THE WASHINGTON SOCIETY OF THE M. I. T.

The society inaugurated its fifth year under very auspicious circumstances by the annual meeting, held on January 2 at the Hotel Barton. After a brief period occupied by the transaction of the regular business, a reception was tendered to the visiting Technology members of the American Association for the Ad-

vancement of Science, which had just terminated its annual convention in this city.

As a result of the meeting and of subsequent appointments by the Executive Committee, the organization of the society for the ensuing year is as follows: Executive Committee: Proctor L. Dougherty, '97, president; Winthrop Cole, '87, vice-president; Albert F. Nathan, Jr., '99, secretary; William J. Rich, '84, treasurer; Archibald L. Parsons, '97. Publication Committee: François E. Matthes, chairman, '95; F. C. Skinner, '71; W. W. Stevens, '98. University Club Committee: W. W. Stevens, chairman, '98; Cyrus C. Babb, '90; J. Earnest Woodwell, '96. Committee on Hospitality: Myron L. Fuller, chairman, '96; Louis A. Simon, '90; Robert S. Blair, '00.

The second part of the programme was enjoyed by all, though we missed a number of professors and representatives of the Institute who had been in town and who were expected to be present, but were obliged to return to Boston before our meeting took place; but we appreciated our good fortune in having with us Professor Niles and Professor Crosby. The latter could remain with us but a short while, however; and, after saying a few words to us, he was reluctantly permitted to take his departure. Professor Niles, however, came to spend the evening, and thereby gave us all much pleasure by the telling of all that was transpiring at the "old stand." It seemed so natural to see him standing before us and to hear his voice that it recalled the "good old days" at the Tech. With all that he has done for the welfare of the Institute and by the intense interest he continues to take in its affairs, he inspires us as a society and as individuals to do our duty by our Alma Mater. The meeting broke up about midnight, and the expressions of all implied that this was one of the most successful of all our meetings.

We are not surprised to meet occasionally with an old professor from Boston in this "city of sight-seeing," for every now and then we run across them in the government departments. This fate befell Professor Harry E. Clifford; and his many friends in the Patent Office and Treasury Department were delighted to greet

him during his rccent sojourn in the city, and we all regretted that his stay could not have been more extended.

At our second meeting, of March 9th, we heard Mr. Gifford Pinchot, the chief forester of the United States, on the question of the forests of the Philippines. His talk was illustrated by a very fine stereopticon, loaned for the occasion by Mr. Hough, of the Patent Office; and, between the excellent views and a most interesting discourse, we were well entertained. Mr. Pinchot was sent to the Philippines by the government for the investigation of the forests of our newly acquired possessions, and his travels covered the whole extent of the islands. The personality of the Filipino received a very favorable treatment at his hands. The importance of the matter of forestry so strongly appealed to the members of the society that the Executive Committee was empowered to appoint a committee to consider certain matters in that connection for the society. Mr. Hayford, of Cornell, who supplied the interesting article in last January's REVIEW, and which has met with such general approval, also was with us, and gave us a short impromptu talk. We appreciated the opportunity of becoming better acquainted with him.

Of the utmost importance to those about to end their career at the Tech is a plan the society has now completed, whereby any Tech man who is considering an appointment in one of the government departments may, by addressing an inquiry to the secretary, have the matter referred to such member as will have a particular knowledge along the line of inquiry, and who will therefore be in a position to supply the desired information. There occur, from time to time, vacancies in the various departments which are well paying and often lead to "good things." With us it is a source of regret to see our own men leaving us; but, as it always means that they are doing better and have new fields open to them, we cannot but wish them every success. But one thing that we do want, and want very much, is to have the gaps filled again by Tech men.

The secretary notes with regret that Mr. W. I. Bickford is about to leave the office of the supervising architect, in order to go

to Pittsburg, Pa., where he will be with the Iron City Engineering Company, Frink Building. Mr. W. L. Morris also announces that he has resigned from the Patent Office to go to Boston and practise patent law with Clarke & Raymond. Mr. A. W. Proctor, our past secretary, has also left the city and has settled in Chicago. Mr. Hunnewell has gone to Camden, N.J.

ALBERT F. NATHAN, JR., '99, *Secretary*,
U.S. Patent Office, Washington, D.C.

THE PITTSBURG ASSOCIATION OF THE M. I. T.

The Pittsburg Association held its fourth annual banquet and reception on Wednesday, February 18, at Hotel Henry. Besides the guest of honor, President Henry S. Pritchett, other guests present were: Professor J. A. Brashear, Julian Kennedy, W. N. Frew, F. H. Taylor, Professor F. L. O. Wadsworth, C. B. Albree, C. F. Scott, Professor S. W. Stratton, Gordon Crawford, John B. Jackson, and Rev. Dr. W. J. Holland.

Calvin W. Rice, president of the Association, acted as toastmaster. Letters of regret were read from many prominent absentees, such as H. C. Frick and W. B. Schiller. A letter to Mr. Rice from Andrew Carnegie, under a New York date-mark, was read, and is as follows: —

My regret at being unable to attend your dinner on the 18th is greatly increased by the fact that you are to have the President of the Institute, my friend Dr. Pritchett, with you as your guest. He is emphatically the right man in the right place, and even the Carnegie Institute could not get along without his advice. It is difficult to imagine a higher position for the doctor than he now occupies; and yet, if there should be one in the country, mark my words, he will get there. The ability to "get there" is the distinguishing feature between the alumnus of the School of Technology and the ordinary graduate of our old universities. However, the latter gets many sweet things, if he has absorbed the true university atmosphere; and he must reconcile himself to coming in second when there is a hard race to be run and won in the business affairs of the world.

President Pritchett told the alumni of the plan to remove the Institute from the city, of the new administrative changes, of the

new department of Engineering Research; and, in concluding, he asked all present to rise for a silent toast to John Daniel Runkle.

The officers for the ensuing year are: president, Calvin W. Rice; vice-president, Percy H. Thomas; secretary and treasurer, Howard K. Jones; Executive Committee, Francis S. Vielé, Morris Knowles, and Sumner B. Ely.

Following is an extract from a letter received from Mr. Calvin W. Rice, president of the Association, giving a report of the meeting: —

In my remarks I brought out that there were about one hundred and twenty-five Technology men in the neighborhood of Pittsburg, forty being engaged in the iron and steel and allied industries, thirty-five in electrical, ten in architectural, fifteen in railroading, ten in general work, fifteen in special work, such as sanitary engineering, city water-works, etc.

Speaking of Dr. Pritchett, Professor Brashear spoke of twenty-two years' most cordial friendship, and quoted from a letter of Dr. Pritchett's successor, O. H. Tittmann, superintendent of the Coast and Geodetic Survey. In this letter Mr. Tittmann spoke of Dr. Pritchett's especial ability in gaining the confidence of the administration, and also in showing that no amount of social or political influence could swerve him from his purpose after having made up his mind that the action which he proposed to take was necessary for the welfare of the survey. During Professor Pritchett's administration of the Survey, the Bureau of Weights and Measures, which had been under the direction of the superintendents of the Survey, was expanded into the National Bureau of Standards. He recognized the necessity of extending the magnetic work of the Survey, and put it under the charge of a specialist. He introduced methods of precise levelling, and during his administration developed an instrument making it possible to do work of great precision, rapidity, and economy.

At the outbreak of the Spanish War many of the officers of the Survey were ordered away, so that, to fill the vacancies, the Survey was put on the civil basis.

Another outcome of the Spanish War was the extension of the duties of the Survey to all the coasts under the jurisdiction of the United States.

Mr. Taylor spoke particularly of the relation of the educated man to business, and gave very excellent advice drawn from his many years of experience.

HOWARD K. JONES, '96, *Secretary*,
314 4th Ave., Pittsburg, Pa.

THE M. I. T. CLUB OF CINCINNATI

The annual meeting was held at the Queen City Club on January 27. There was a fair attendance, but not as large as expected, nor as many from out of town as would undoubtedly have come, had there been any special incentive, such as the visit of President Pritchett or other representative of the Institute. We had written to President Pritchett, hoping that he could be with us; but it was not until the day of the dinner that we learned that he was to be in Ohio in February, so we could not postpone the dinner at that time. It was unanimously voted to hold another meeting during the President's trip to the West, but it was found later that he will not have an opportunity to come to Cincinnati this season. We all enjoyed the President's visit last year to such an extent that our inability to have him with us has been a keen disappointment. It may be rather hard on Dr. Pritchett to furnish all the enthusiasm for the local alumni associations, but it remains a fact that his coming among us has stirred up interest in Technology matters such as no other event has done for some time past.

We have the nucleus here of a very creditable association; and we live in hopes of growing and becoming more and more useful, not only so far as our own members are concerned, but to the interest of the Institute at large. We were glad to welcome into our Association a number of new members, among them Mr. A. S. More, '02, who was able to give us the latest news from the Institute. In contrast to this, Mr. E. J. Carpenter, '72, told us of the life of the Institute in the earlier days.

The Nominating Committee evidently feared they would lose part of the dinner if they deliberated long upon the problem before them, and so recommended the re-election of all the officers of the previous year. This may have been done as a recognition of the efforts of the officers in organizing the club, or from a feeling that any Committee on Organization which had the assurance to elect itself to all the official positions was entitled to the complimentary vote of the club.

The noonday lunch on the first Tuesday of each month is proving an interesting feature, and will undoubtedly be continued.

The Institute is well represented among the architects of the city. A. O. Elzner, now of Elzner & Anderson, and Gustave Drach have been the sole representatives for some time. We now have Walter Rapp, '00, of Rapp, Zettle, and Rapp; Harvey Hannaford, of S. Hannaford & Sons; while Rudolph Tietig, '98, and Walter Lee, '98, have associated together under the firm of Tietig & Lee. A. S. More, '02, and C. B. Clark, '97, are associated with Mr. G. W. Kittredge, '77, chief engineer of the Big Four. R. W. Proctor, '94, who entered the employ of the W. S. Merrell Chemical Company as chemist after his graduation, and who for some years past has occupied the position of superintendent, has recently been elected secretary of that company.

CHAS. G. MERRELL, '88, *Secretary*.
5th Ave & Pike St., Cincinnati, Ohio.

MERRIMAC VALLEY TECHNOLOGY ASSOCIATION

The annual meeting of the society was held at the Board of Trade rooms, Lawrence, Friday evening, February 6. Fourteen members were present, including men from Haverhill and Lowell.

The following officers were elected for the ensuing year: president, F. H. Silsbee, Lawrence; vice-president, Linwood O. Towne, Haverhill; secretary, John A. Collins, Jr., Lawrence; treasurer, William O. Hildreth, Lowell; member of Executive Committee, Ivar Sjöström, Lawrence.

At the close of the business meeting Mr. Towne, of Haverhill, entertained the members for over an hour by relating incidents of life in a mining camp in the early eighties. At that time he, with several other Tech men, was located near Leadville, Col.

The club has a present membership of about forty-five. The week after the meeting the secretary received copies of the proposed constitution to be used in common by all Tech societies, but no action has been taken as yet. The new constitution follows very closely the one originally adopted by the Association, so very little change will be necessary.

JOHN A. COLLINS, Jr., '97, *Secretary*,
79 Tremont St., Lawrence, Mass.

THE TECHNOLOGY CLUB

Since the last report, issued in the January number of the REVIEW, the following Smoke Talks and Ladies' Nights have been held at the club: On the eighth evening of the season, Tuesday, January 20, Señorita Carolina Holman Huidobro, of Chile, gave a brilliant and amusing talk, illustrated by the stereopticon, on "Typical Life in Chile." Many members and ladies were present. Dr. Henry Hopkins, president of Williams College, gave an intensely interesting talk on some of his experiences in the Civil War, as a chaplain at the front, on the ninth evening, January 23. On February 3, Herr Heinrich Conried, manager of the famous Irving Place Theatre in New York City, and recently appointed director of the Metropolitan Opera, gave an illuminating talk, interspersed with personal reminiscences, on "The Modern German Drama." Unfortunately, and partly because of a Faculty meeting and other meetings at the Institute, the attendance was not so large as usual. Indeed, the numbers at the last smoke talks have been so small as to make it seem wise to discontinue for a time this feature. The talks will be resumed in the fall, and one or two more may be held this spring. February 24, the eleventh evening of the season, was a ladies' night; and Dr. John C. Bowker, the well-known lecturer, gave an effective talk on "Imperial India," illustrated by many stereopticon slides, a large number of which were colored. The common room was filled with members and their friends.

Some of the classes have appointed certain days in the month for regular meetings when the class members shall dine together, partaking of the regular club *table d'hôte*. This is in addition to the formal dinners which are held annually by many classes at the club.

The club membership is approaching the limit of five hundred resident members.

WALTER HUMPHREYS, '97, *Secretary*,
83 Newbury St., Boston, Mass.

NEWS FROM THE CLASSES

1868.

PROF. ROBERT H. RICHARDS, *Sec.*, Mass. Inst. of Technology, Boston.

Whitney Conant is secretary and treasurer of the Jersey City Water Supply Company at Paterson, N.J. In the engineering corps of this company are the following Technology graduates: W. B. Fuller, '83; J. Waldo Smith, '87; Elmer G. Manahan, '92; John H. Gregory, '95; Ross Hasbrouck, '99; and Philip Burgess, '99.— George R. Hardy is assistant engineer of construction, N. Y., N. H. & H. R.R., Old Colony System, at Forest Hills, Mass.

1875.

E. A. W. HAMMATT, *Sec.*, 10 Neponset Block, Hyde Park, Mass.

The twenty-first annual meeting of the class of '75 was held at Young's Hotel, March 6, 1903, at 7 P.M. After an hour of sociability the company sat down to dinner, and at 9.15 was called to order by President Hibbard for the transaction of business. The records of the twentieth annual meeting and of the special meeting held on June 13, 1902, at Dr. Mixter's, were read and approved, as were the reports of the secretary and treasurer. Upon vote of the class the secretary cast a ballot, as that of the class, for the re-election of the old board of officers, and the following were declared elected: president, Thomas Hibbard; vice-president, B. L. Beal; secretary and treasurer, E. A. W. Hammatt; executive committee, B. L. Beal, C. H. Williams, S. J. Mixter. The meeting adjourned at 11 P.M. The attendance was as follows: Aspinwall, Atkinson, Beal, Bowers, Dorr, Haberstroh, Hammatt, Hibbard, Kinnicutt, Lincoln, Mixter, Prentiss, Ruddick, Stoddard,

and Willard. Brief letters were received from a number of men who were unable to be present.— Chris. A. Church is located at Vicksburg, Miss.— Shockley has recently been in Texas.— Edes is relocating the Central Pacific Railroad in the Sierra Nevada Mountains.

1876.

JOHN R. FREEMAN, *Sec.*, 145 Morris Avenue, Providence, R.I.

Charles T. Main has become one of the most widely known and most busily occupied of our New England mill engineers. He has, for several years past, acted as consulting engineer for the American Woollen Company, and, among other important work, has recently planned and supervised the construction of one of the largest woollen mill buildings in this country. This is located at Maynard, Mass. He is also consulting engineer for the Montreal Cotton Company, and during the past two years has planned and supervised for them the construction of a new 40,000 spindle mill and new steam plant. He is consulting engineer for several textile mills in the vicinity of Lawrence, Mass., consulting engineer on matters of steam and water power for the well-known electrical firm of Stone & Webster, and is at present, in co-operation with them, engaged in planning water power developments at Taylor's Falls, Minn., and in Seattle, Wash. Mr. Main has also recently visited Mexico for examinations and reports for the Guanajuato Power and Electric Company. Has also recently visited the West to make examinations and reports for water powers on the Platte and Loup Rivers; has very recently been appointed consulting engineer to the United Shoe Machinery Company on their new plant at Beverly, Mass.; is building a paper mill at Bennington, Vt.; and is now supervising the completion of a paper-coating mill at Lawrence and planning reorganizations of the power plant at the Pacific Mills.— Frederick K. Copeland continues his activities as president of the Sullivan Machine Company, which is one of the leading firms in this country in the development of coal mining machinery and diamond drills for mine exploring purposes. His factory has

recently made very large extensions to its plant, and is now employing about eight hundred men as against half that number three years ago. Mr. Copeland has developed so much of the "pushful," hustling Western business man that the secretary ventures the opinion that he would, on sight, be labelled as "from Chicago," — truly a great transformation from the bashful, quiet, retiring, studious youth of twenty-seven years ago.— Theodore J. Lewis continues as vice-president and treasurer of the Standard Car Wheel Works of Philadelphia, which has extensive factories at Logan, Pa. This concern is one of the leading producers of locomotive tires in this country, and is understood to operate in close harmony with the Baldwin Locomotive Works, and supply a large part of the tires used by that concern.— During the past year W. O. Crosby has been advanced to the grade of Associate Professor of Geology, and is now in charge of the Geological Department. Outside of the Institute he has been engaged in a detailed and systematic study of the Boston Basin. This work, formerly under the auspices of the Boston Society of Natural History, has been assumed by the United States Geological Survey, and will be completed by W. O. Crosby in co-operation with Dr. T. A. Jaggar, Jr., of Harvard. He has also given much time to economic work in connection with mines and quarries, chiefly in the Far West, but including also Missouri, North Carolina, the Adirondacks, etc. He continues to act as consulting geologist to the Metropolitan Water Board, especially in connection with the new aqueduct. Publications of the past year include papers on the "Auriferous Veins of Algoma," the "Iron Ores of the Antwerp-Fowler Belt in New York," a study of hard-packed material, and the "Origin of Eskers." Last July he examined and reported on the extensive deposits of colored marble (American Siena) in the vicinity of Canyon City in Colorado. He was joined in Colorado Springs by Mr. I. E. Adams, one of the advanced students in the Geological Department; and early in August they went to California, visiting the petrified forest of Arizona *en route*, and made a professional examination of some gold properties in the Mother Lode Belt in Mariposa County. Thence they proceeded, via San

Francisco and Los Angeles, to Nogales, Ariz., and spent several days studying the copper deposits of Washington Camp in Arizona and La Cananea in Sonora. Before returning North, they devoted a week to the examination of sulphur deposits and mines in the State of Durango, Mexico, and then made a long march across country, via Colorado Springs and Salt Lake, to Seattle, and returned East via the Canadian Pacific, stopping several days to enjoy the scenery of the Selkirks.

1877.

RICHARD A. HALE, *Sec.*, Lawrence, Mass.

The annual reunion was held at the Algonquin Club, Boston, in February, where the members were invited to dine by the president of the class, Mr. Frank E. Peabody. Twenty-four members were present at the meeting. The officers elected were: Frank E. Peabody, president; H. H. Carter, vice-president; and R. A. Hale, secretary-treasurer. Among others of the class present were Profs. C. H. Peabody, G. F. Swain, and Linus Faunce. Business interests were represented by C. A. Clarke, of Hill, Clarke & Co., dealers in general iron and woodwork machinery; E. Clement, of the firm of Clement & Co., brokers, Boston. The engineers were represented by A. L. Plimpton, in charge of the surface lines, Boston Elevated Railroad; G. A. Nelson, of the city engineer's office, Lowell; F. P. Spalding, of the city engineer's office, Boston. Joseph P. Gray, vice-president of the Boston Manufacturers' Insurance Company, represented extensive insurance interests. John Alden, of the Pacific Mills, and R. A. Hale, of Lawrence, were present. Informal remarks were made relating to change of location of the Institute, and letters and telegrams from absent members were read. A letter was received from E. G. Cowdrey, manager of the Milwaukee Gas Company, expressing regrets that he could not attend; also from W. H. Lawton, civil engineer of Newport, R.I., where he has recently been elected city engineer. Frank B. Locke has recently been elected city engineer of North Adams, Mass. An interesting feature of the meeting was the canvass of the number of

children of the members present. There were twenty-one married men and three unmarried men present. The number of children represented by the married men was forty-three, or practically two to each family, thus agreeing with President Eliot's statistics. — In the *Engineering Record* of March 21, 1903, it was stated that E. G. Cowdrey, for some years general manager of the Milwaukee Gas Light Company, has been made general manager of the Laclede Gas Light Company of St. Louis.

1878.

LINWOOD O. TOWNE, *Sec.*, Haverhill, Mass.

J. W. Rollins, Jr., of the firm of Holbrook, Cabot & Rollins, is personally directing the construction of the new Boston-Cambridge bridge, replacing the famous "Longfellow" one. The firm is also working on a section of the New York subway.— The class held its annual reunion and supper at Young's on the evening of January 5. As usual, there were no formal exercises. For the twenty-fifth reunion after graduation, to occur next winter, an invitation was informally given by President Baker to meet at his home in Brookline. Those present were Baker, Collier, Higgins, Rich, Rollins, Sargent, Schwamb, Williams, Woolworth, and Towne.

1882.

WALTER B. SNOW, *Sec.*, Watertown, Mass.

Upon February 5 the class celebrated its twenty-first anniversary dinner at the Technology Club. Darrow, Gerry, Gooding, Hall, Herrick, Jenkins, Low, Munroe, Snow (W. B.), Walker (A. W.), and Warren were in attendance. Plans were laid for a gathering of members, with ladies, at the Tech "Pop" concert in the spring. Wood, whom none of the men has seen since his Freshman year, fully expected to be present, but was prevented by sickness. The same was true of Duker. At the time of the dinner Gardiner was abroad in England, and J. H. Ross had just sailed

for Europe.— Faunce and Manning were both present at the dinner of the Pittsburg Association and reception to President Pritchett in February. — Mansfield is with the Massachusetts Construction Company, and was last located at Haverhill, Mass.— A daughter was born to Mr. and Mrs. Frank Cheney on May 27 last.— In *Engineering News* for Feb. 26, 1903, appears a description, by H. G. Manning, of the new plant of the Jessop Steel Company at Washington, Pa., the design, construction, and erection of which have been entirely in his hands. Although he still retains his connection with this company as mechanical engineer, he has organized the Washington Foundry and Machine Company, of which he is president, and the Pennsylvania Air Brake Company, of which he is president and general manager. The latter company will manufacture railway car brakes under Manning's patents.— On March 23, Munroe spoke at the Second Church, Boston, on "Nineteenth-century Education." This was the third lecture in a course of six being given under the direction of Miss Symonds, Miss Wheelock, Mrs. Perry, and Mrs. Stannard. It was also the tenth lecture in a course on the "History of Education" which Munroe has been giving during the winter to the students of the Kindergarten Training School.

1887.

EDWARD G. THOMAS, *Sec.*, 4 State Street, Boston, Mass.

The sixteenth annual meeting was held at Young's Hotel, Boston, on the evening of Feb. 21, 1903. The officers chosen for the coming year were: president, H. Souther; vice-presidents, M. W. Cooley and H. C. Spaulding. There was no business to transact, so the evening was spent in talking over old times and present circumstances and work. The proposed removal of the Institute from its present location was fully discussed; and it seemed to be the unanimous opinion that, if such action was to be taken, any half-way measures would be a mistake, and that a point should be chosen where ample ground for all probable increase should be afforded and where athletic fields of good size could be had. Those

present were H. S. Adams, H. F. Bryant, Cameron, Cobb, Coburn, Cooley, Draper, Hathaway, Lane, Nutter, H. D. Sears, Souther, Spaulding, Sprague, C. K. Stearns, Taintor, E. G. Thomas, Fred Thompson, Very, Wakefield, W. A. Whitney, and Young. The greetings of the class were sent to the North-western Association, who were meeting in Chicago, and the following telegram was received in return : —

The greatest Alumni Association greets the greatest Class of the Institute. SCHMIDT, SHORTALL, STURGES.

Fred Thompson was the greatest stranger, and reported that, while nominally in charge of the Norfolk Navy Yard, he is at present stationed at the Brooklyn Yard on an examining board.— George Otis Draper acknowledged the authorship of the book "Searching for Truth" that has excited much controversy through its free criticisms of present-day religions. He has just ordered his sixth automobile, a Winton.— Shepard sent a telegram to the class with his good wishes, announcing that he is a "daddy." A son, David Allan Shepard, arrived on January 29.— Sprague is now in Arizona and California in connection with mining work. He has recently made examinations of street railway properties in Iowa and Georgia.— Davenport is recovering his health in Florida.— The following changes in business locations are noted: Armington is now manager of the Cleveland Crane and Car Company, at Wickliff, Ohio. W. B. Blake is assistant real estate agent of Pennsylvania Lines West of Pittsburg, and his office is in the Union Station, Pittsburg. Bliss is mining at Nome. W. C. Cushing is now chief engineer, maintenance of way department, of the South-west System of the Pennsylvania Railway, and stationed at Pittsburg. E. A. Haskell is Boston & Albany roadmaster at Pittsfield, Mass. Henry F. Hill has moved to Augusta, Me., and is still engaged in civil engineering. Charles B. Kendall is resident manager of the United States Finishing Company of Pawtucket, R.I. Livermore is chemist for the American Woollen Company, Lawrence, Mass. Mrs. Palmer (*née* Helen Cooley) is assistant surgeon of the New York Ophthalmic Hospital. Safford is with the France Packing

Company at Tacony, Pa. W. D. Sargent is president of the American Brake Shoe and Foundry Company. H. D. Sears has moved to the Board of Trade Building, 131 State Street, Boston. Sever is now electrical engineer for the city of New York in addition to his work at Columbia University. H. E. Smith is chemist and engineer of tests for the L. S. & M. S. Railway, at Coltinwood, Ohio. J. W. Stearns is resident engineer for the C. C. C. & St. Louis Railway. F. A. Thomas is treasurer of the Pawtucket Foundry Company, Pawtucket, R.I. Weil has opened an office as consulting mechanical engineer at 1112 Union Trust Building, Detroit, Mich. Henry F. Stoddard is manager and superintendent of the Wall Rope Works at Beverly, N.J.

1888.

WILLIAM G. SNOW, *Sec.*, 245 N. Broad Street, Philadelphia, Pa.

Charles A. Stone is a member of the Corporation of the Massachusetts Institute of Technology.— W. G. Besler, general manager of the Central R.R. of New Jersey, was the principal speaker at the New Year's meeting, in Philadelphia, of the Philadelphia & Reading Railway Y. M. C. A.— Victor Ray is a practising oculist in Cincinnati, Ohio.— John Stites Ray has removed from Colorado Springs to Brooklyn, N.Y., where he is located at 296 McDarrough Avenue.—H. J. Horn is general manager of the coal department of the North-western Improvement Company.— G. U. G. Holman, general manager of the Canadian Electric Light Company and president of the Lewis County Railway Company of Lewis, P. Q., Canada, spent the winter at the Château Frontenac, Quebec, where he is still located.— The Equity Court at Washington, D.C., granted an injunction in March to restrain the Postmaster-general from further refusing to transmit at second-class rates a certain publication issued by the Bates & Guild Company of Boston.— Luther Dean has been elected city engineer of Taunton, Mass.

1890.

GEORGE L. GILMORE, *Sec.*, Lexington, Mass.

F. L. Chase, member American Society Civil Engineers, having been elected president of the Jamestown, Chautauqua & Lake Erie R.R. Company and the Chautauqua Steamboat Company, has resigned the position of engineer of bridges of the New York Central & Hudson River R.R. His headquarters are at Jamestown, N.Y.— John O. DeWolf is now associated with the mill engineering firm of W. B. Smith-Whaley & Co. as a partner. Their headquarters are in the Tremont Building, Boston, with a branch office at Columbia, S.C.— Calvin W. Rice has been elected a member of the Institution of Electrical Engineers of London, having been proposed by Lord Kelvin. At the last meeting of the M. I. T. Alumni Association of Western Pennsylvania, he was made president.— George L. Gilmore, with Mrs. Gilmore, spent the month of February in the South, most of his time being devoted to the Florida golf courses.— William R. Peyton and Miss Jean Rosser were married January 21 at Superior, Wis.— Rev. W. D. Roots is now located at Grangeville, Ida., a place which it takes the mail twelve days to reach. He is still a "circuit rider," and is doing his usual good missionary work, covering during the week some twenty to thirty miles of territory.

1891.

CHARLES GARRISON, *Sec.*, Lexington, Mass.

Robert D. Cushing who was recently assistant engineer on the N. Y. C. & H. R.R., has been obliged to return home on account of illness. He is now at Lunenburg, Mass., and would undoubtedly appreciate hearing from his friends.— Francisco M. Pinto, of Rio de Janeiro, Brazil, has been with the Leopoldina Railway since 1891. He is now in charge of the claims department and Inspector of goods and passenger stations.— George K. Hooper's engineering business has increased so that he has removed from Boston, and is making his headquarters at 11 Broad-

way, New York, N.Y. Margaret E. Maltby, Ph.D., has been appointed adjunct professor of physics at Barnard College.

1892.

PROF. WM. A. JOHNSTON, *Sec.*, Mass. Inst. of Technology, Boston.

In a circular sent out by Edwin R. Weeks, consulting engineer, announcing the partnership of Weeks, Kendall & Newkirk, are the following interesting facts in regard to Kendall and Newkirk: William R. Kendall, a graduate of the M. I. T. class of '92, formerly with the Franklin Electric Company, is consulting engineer for the Woods Zinc Mines of Arizona and vice-president of the William W. Kendall Boot and Shoe Company of Kansas City. Mr. Kendall combines a thorough technical training in engineering science with ten years of successful business experience.— Walter M. Newkirk is also a graduate of the M. I. T., where he was later an instructor in Mechanical Engineering. He served several years on the engineering staff of the Detroit Public Lighting Commission in planning, constructing, and operating the Municipal Electric Lighting System of Detroit, Mich. With Smith & Conant, experts in patent causes and consulting electrical and mechanical engineers of New York City and Detroit, he had an extensive and practical experience in designing and supervising private lighting and power installations, steam, hydraulic, and electric elevator and conveyor equipments, and the construction and reconstruction of railway plants. He is familiar with all systems of heating and ventilation, and is an expert in testing, inspection, and reports. As consulting engineer for the Buhl Malleable Company of Detroit, Mr. Newkirk had an intimate acquaintance with the furnaces, annealing ovens, etc., used in the treatment of metals.— Gayle T. Forbush, general agent German American Insurance Company, who is widely known in the insurance circles of Massachusetts and the adjoining States, was recently elected chairman of the Executive Committee of the New England Insurance Exchange.— Professor Charles E. Fuller and Professor Charles F. Park have each given

a series of twelve lectures in the Lowell Free Courses the present year, Fuller's subject being "Applied Mechanics and Tests of Materials," and Park's subject, "Elements of Mechanism." Park has also given three courses at the Wells Memorial on "Mechanical Drawing," "Mechanism," and "Practical Mechanics."— Professor Louis Derr read an interesting paper before the Society of Arts, February 26, on "Some New Apparatus for Illustrating Certain Electro-magnetic Phenomena."— Professor George V. Wendell is giving a course of lectures on "Physics" in the Simmons College for Women, organized last fall.— Mr. and Mrs. James H. Harlow announce the marriage of their daughter Florence to Mr. George Freeman Rowell, Thursday, the 5th of February, at Edgewood Park, Pa.— William Stickney died on May 7, 1902.— Lewis P. Cody, who is president and treasurer of the Grand Rapids Electric Company, Grand Rapids, Mich., writes in reply to a letter informing him of his election to the office of assistant secretary and treasurer of the class, also requesting information in regard to himself: "Your kind letter at hand. It is very gratifying to me to be remembered by my old classmates in such a pleasant way, and I assure you I shall endeavor to carry on the duties and responsibilities of the office with becoming dignity. The North-western A. A. meets in Chicago the 21st of February for the annual banquet, and I expect to go over there. I have missed only one or two of these banquets since leaving school. We always have a large crowd (several hundred) and a great time. There are usually about six or eight of our class there, but I have gotten acquainted with a great many in other classes. There are a great many Tech men in and around Chicago, and nearly all hold responsible positions. My own business here is very good, and I am making quite a little out of it, and I am my own boss; but I cannot get away very easily. I would not give up my business for any position that I know of. With kindest regards," etc.— Leonard Metcalf left Boston February 27 on a business trip to Porto Rico, and expects to return about the middle of April.— The following replies were received at the time of the class decennial: Gorham Dana: "After graduation I spent an interesting year in California with

the United States Geological Survey and at the University of California. On the way home I did a little sight-seeing, going into the Yosemite Valley, and stopping at the Yellowstone Park, Denver, Salt Lake City, and other places. After spending a year at Tech trying to expound the mysteries of surveying to the youthful class of '96, I went into the fire insurance business, or, more strictly, fire insurance engineering, where I may still be found. Have not tempted fate by taking a better half."— A. J. Ober: "The first five years after leaving Tech I spent in private and municipal work, mostly on water and sewer lines, and the last five in the employ of the government. Am just now in charge of an extensive survey of the Connecticut River, Hartford to Holyoke. The last Class Directory tells the rest. Have had no wonderful adventures, nor have I created any panic in the stock market."— J. D. Hilliard, Jr.: "During the last ten years I have stuck to electrical work, first as student, later assistant works engineer, Canadian General Electric Company, assistant engineer switchboard department, General Electric Company at Schenectady, and now have charge of the electrical work of the Hudson River Water Power Company and Hudson River Electric Company, who are building a dam at Spier Falls, N.Y., and transmission lines to points within a radius of forty miles,— capacity, 40,000 H. P., 30,000 volts. I still pay board for one. I extend an invitation to the members of the class to visit me at the Falls when convenient, and can assure all that a view of the works will amply repay the trouble of reaching here over the D. & H." — Edward R. French: "It hardly seems that ten years have passed since we graduated. After graduation I secured a position with the Electric Light Company of Elizabeth, N.J., and was with this company until I entered the New York office of the American Electric Heating Corporation. After two years there I was sent to the main office and factory here in Cambridge, now known as the Simplex Electric Heating Company. Was married in 1895, and have two daughters, Reba, age four years, and Doris, age six months."— F. H. Meserve: "I am looking forward to the reunion with the keenest pleasure. If it should happen that I can-

not be there, I send the following items, as requested: Business, 1902 dry-goods commission. Treasurer and director in several woollen mills. Married Nov. 6, 1899. Have one daughter." — Andrew R. Robertson: "I have to confess, to my shame, that when I arrived in Boston the other day I was so forgetful of the lapse of time that I did not recollect that this was the tenth year since our graduation. I am afraid that more than I are in the same case, and that in this workaday world very few of us stop to ask how time is passing. It is wrong, of course; but the row which most Tech men have to hoe requires a fixity of attention which leaves little opportunity for anything else but work. I have heard it said, though we should be the last to boast, that the class of '92 was a particularly talented class, and turned out a set of men above the average run. I am quite ready to believe this; but, if any statistics are gathered at your reunion, please let me have them, for, as you know, in spite of my interest in Tech and things American, I am far out of your world in my own city of Glasgow, and my information is fragmentary. I am sorry, indeed, that I am unable to be present at your celebration; and I trust you will express my regrets to my classmates. I feel these regrets all the more, as I feel that, when Fortune brought me back to Tech, she might have timed things better. At a meeting like this I suppose one has more or less to account for one's self; but I have little to say, except that I am still on the road up-hill like the rest of you. I am here in the United States and Canada, looking round; for, having been at Tech, I realize that there is always an interchange of knowledge and experience to the advantage of all in such visits. I cannot close a letter of this kind without expressing my admiration of the wonderful progress made by the Institute during the last ten years, and expressing the hope that this progress is as solid as it seems, and will proceed steadily in the future. I was also glad to renew acquaintances with so many old friends, and to notice that Time had dealt leniently with most of them. I have to express my sorrow in realizing that our late President is no longer with us, whose time always was ours, and who made us strangers feel at home."

1893.

FREDERIC H. FAY, *Sec.*, 60 City Hall, Boston, Mass.

Remember the Decennial Celebration on Tuesday and Wednesday, June 9 and 10.

The first informal meeting and dinner of the winter was held at the Technology Club on Saturday evening, January 24. Those present were Badger, Bemis, Blood, S. A. Breed, Crosby, Dawes, W. E. Evans, Fay, E. S. Page, Pickert, Soley, Spofford, and J. S. Wadsworth. There was no speech-making, and the entire evening was given to general sociability. At the second informal dinner on Saturday evening, March 21, the class had the good fortune to entertain as its guest Professor Burton, Dean of the Institute. In a most interesting way Dean Burton spoke upon the duties of his new position and the changes that had come in the student life since the days when we were undergraduates. The attendance at the second meeting was Baxter, Bemis, Biscoe, Blood, Dawes, Fay, Hopewell, A. L. Kendall, H. A. Morss, E. S. Page, W. B. Page, Pickert, Spofford, Thorndike ('94), and Waterman.— Orton W. Albee is with Charles C. Bothfield (M. I. T. '84), consulting engineer on iron and steel structures, 34 Home Bank Building, Detroit, Mich.— Minard T. Barbour is Montreal manager of the Canadian Otis Elevator Company, 164 St. James Street, Montreal, Canada.— Hereford Berry, formerly chief draughtsman of the Crocker-Wheeler Company, Ampere, N.J., is assistant mechanical engineer of the dynamo and motor department of Siemens Bros. & Co., Limited, Woolwich, Kent, England.— James C. Boyd is engineer of maintenance, Bangor & Aroostook R.R., at Houlton, Me.— Lieutenant S. Parker Bremer, after more than nine years' service in the First Corps of Cadets, Boston, resigned his commission as paymaster and mustering officer, and was honorably discharged, Jan. 20, 1903. *General Orders*, in announcing his resignation, say: "The loss of Lieutenant Bremer's services will be severely felt by the Corps; and it regrets extremely that, by reason of large business responsibilities unexpectedly thrust upon him, this excellent officer felt obliged to resign." Lieutenant Frank F. Phinney, another '93

man, has been commissioned paymaster and mustering officer in Bremer's place.— James F. Campbell, after leaving the Institute, spent a year at Lehigh University. He then took up the study of law at the University of Pennsylvania Law School, graduating with the class of 1895, and being admitted to the Philadelphia bar in June of that year. Since then he has practised law in Philadelphia. He is one of the counsel for the Philadelphia & Reading Railway Company, local counsel for the United States Express Company, and for four years has represented the Commonwealth of Pennsylvania in escheats arising in Philadelphia County. He is a member of the Republican County Committee of Montgomery County, and of the Lawyers' Club and the Young Republicans of Philadelphia. Campbell's address is Franklin Building, 133 South Twelfth Street, Philadelphia. He was married Jan. 30, 1902, to Miss Bertie M. Plunkett, and lives at Wyncote, Montgomery County, Pa.— H. L. Clapp is practising law at 140 Dearborn Street, Chicago, his specialty being patent and trade-mark law. He attended the Columbian University Law School for four years, receiving therefrom the degrees of LL.B. in 1896, LL.M. in 1897, and master of patent law in 1898.— George Frink Dana of Cincinnati, Ohio, is to be married on April 15 to Miss Clarissa Halstead, daughter of Murat Halstead, of that city. Dana is a member of the manufacturing firm of Dana & Co., 9th and Sycamore Streets, Cincinnati. He is a prominent club man, being governor of the Queen City Club, a director of the Cincinnati Gymnasium and Athletic Club, and a member of The Pillars, the Cincinnati Golf Club, and the Cincinnati Country Club. Dana's home address is 945 Dana Avenue, Avondale, Cincinnati, Ohio.— Jules Godchaux, of Raceland, La., has been since 1893 resident director and manager of the Raceland properties of the Leon Godchaux Company, Limited, the largest producer of cane sugar in this country. In addition to and connection with this work he is now general manager of the Sterling Sugar and Refinery Company, Limited, and general manager of the Shady Side Sugar Company, Limited. He is also connected in business with various New Orleans mercantile houses. As an engineer, Godchaux has built the Raceland, Reserve, and Kenil-

worth sugar factories, and has been generally engaged in drainage work and in reclaiming lowlands in Louisiana. He is a member of the Louisiana Engineering Society, the New Orleans Progressive Union, the Planters' Club, and many other clubs in New Orleans and Louisiana. He takes an active interest in politics, about which he writes: "I have been what you 'Yankees' call an alderman from my ward. I was a delegate to the Republican National Convention at Philadelphia in 1900, and am at present chairman of the Republican Third Congressional District Committee of Louisiana. I was defeated for the State Senate by a good old Southern Democrat." Concerning his work since leaving the Institute, Godchaux writes: "Close adherence to 'the strenuous life' has made my career of recent years eventful. Among the alluvial and lowlands of Southern Louisiana one's energy can well be expended, as new conditions constantly present themselves. The commercial condition of the sugar industry in the States stimulates and makes necessary constant study for the attainment of such methods and economies that will result in making Louisiana forever a factor in the supply of sugar to the consumers of that commodity at home. Tariff agitation has weakened the stability of that industry that feeds the liberated slaves. Gradually our margin of profits lessens, and year by year must our mechanical and chemical achievements in sugar work be more strenuous and more marked. 'Cuba Libre,' from the view point of humanity, was welcomed by all; but 'Cuba Annexed' is our *bête noire*. From an engineering standpoint, Louisiana leads the world in the manufacture of sugar from the cane. Climatic conditions alone make our efforts need government assistance."— Frank Houghton was appointed cashier of the National Exchange Bank of Boston in February, having been promoted from the position of assistant cashier.— Frederic H. Keyes is general manager of the Robb-Mumford Boiler Company, 170 Summer Street, Boston.—Harley W. Morrill is mill superintendent of the Ludlow Manufacturing Associates, Ludlow, Mass., a position which he has held for the past two years.— H. W. Nichols has the distinction of having had one of his publications translated into a foreign language. His work on

"Ores of Colombia" (Field Columbian Museum, Publication No. 33, Geological Series, Vol. I., No. 3, March, 1899) has been translated into Spanish, and has appeared in the *Riqueza Mineral de la Republica de Colombia*, Bogota, 1901.— Joseph C. Noblit is sales agent of the Hallwood Cash Register Company, 41 Dearborn Street, Chicago, Ill.— Dalton Parmly, until recently with the Marine Engine and Machine Company of Harrison, N.J., has just accepted a position with the Clariton Steel Company at Clariton, Pa. Since leaving the Institute, Parmly has been engaged in the iron and steel business, generally at blast furnaces, in the capacity of chemist or superintendent.— Elwyn W. Stebbins has become a mining engineer, and is located at Telluride, Col. He writes as follows: "After leaving the M. I. T., I obtained employment with the Southern Pacific Railroad Company, and worked in their engineering force in California, Arizona, and New Mexico for about five years, the latter part of the time as assistant to the resident engineer of the Western Division at Oakland. Typhoid fever, with a long and tedious convalescence, next intervened. Upon complete recovery, being desirous of entering the mining field, I took a year and a half at the University of California, and graduated from their mining college in 1901. Since then I have been employed by the Liberty Bell Gold Mining Company, and at present am surveyor and engineer at the Liberty Bell Mine."— Charles W. Taintor is in the London office of the General Electric Company of New York, his address being 83 Cannon Street, London, E.C., England.— Frederick T. Towne, general superintendent for Yale & Towne, Stamford, Conn., has been elected president of the National Founders' Association.— William C. Whiston has a position with the circulation department of the *Mail and Express*, New York City.

1894.

SAMUEL C. PRESCOTT, *Sec.*, Mass. Inst. of Technology, Boston.

The annual meeting and dinner of the class was held at the Technology Club on Saturday evening, March 7. The attendance

was small, only thirteen men being present, but notwithstanding this drawback it was a very pleasant reunion. The election of officers, conducted by mail, was announced at the meeting, W. E. Piper having been chosen president, and H. W. Gardner, vice-president. Plans for the tenth reunion of the class in 1904 were discussed, and the executive committee was given full power. Those present at the dinner were Breed, Jno. Chapman, Claflin, Howes, Phelan, Piper, W. H. Pratt, Prescott, Robb, Sayward, Tenney, Thorndike, and Whiton. Robb, who was with the class for the first time since he left the Institute in 1891, is now superintendent of the Robb Engineering Company in Amherst, N.S., and, although he was with us but a year, is one of the most loyal members of the class organization. It was a great pleasure to welcome him at the dinner.— Chapman, also, returned to us after a long absence; for this was the first class dinner he had been able to attend since graduation. He is now located in Boston as inspector with the Underwriters' Bureau of New England, not with the Pratt & Whitney Company as recorded in the recent catalogue.— Whiton is treasurer and general manager of the New Bedford, Martha's Vineyard & Nantucket Steamboat Company, and during the past year has had charge of the design and construction of the company's new steel steamer, "Uncatena."— Eight '94 men (Brown, M. S. Chace, Cutler, King, McJennett, Pollock, Taber, and one other whose name the secretary has not been able to learn) were present at the annual dinner of the M. I. T. Society of New York.— W. F. Spalding is with Adams & Company, investment bonds, 20 Broad Street, New York.— H. E. Warren has returned to Boston after an absence of several years, and is superintendent of the Lombard Governor Company, 36 Whittier Street.— Dr. Sayward has opened an office at 746 Dudley Street, Dorchester.— A. W. Tidd and F. H. Robbins are with the Commission on Additional Water Supply of New York City. Tidd sends 2023 Park Row Building as his address at present.— Leslie Dana was married in November to Miss Judith B. Brown. Dana is assistant superintendent of the Charter Oak Stove Company, St. Louis.— A. B. Tenney spends most of his time at Portsmouth, N.H., as

assistant general manager of the Rockingham County Light and Power Company. The Portsmouth power station is the central generating plant for an extensive network of electric roads throughout South-eastern New Hampshire and the north-eastern corner of Massachusetts.— The secretary received an interesting note from F. S. Howland not long since. Howland is now member of the firm of Howland & Son, general merchants, Athens, N.Y.— F. C. Baker is with the new Lackawanna Steel Company at Buffalo, as assistant engineer of the Engine Division.— Frank Drake writes that his present headquarters are at 610 Wolvin Building, Duluth, Minn., and his occupation chief engineer of the iron mines of the United States Steel Corporation.— F. B. Abbott is temporarily at the Teachers' College, New York City, although still in charge of manual training at the State Normal School of Emporia, Kan.— S. A. Breed is with the testing department of the General Electric Company at Lynn.— M. S. Chace, president of the Crescent Shipyard Company of Elizabeth, N.J., is also president of the Samuel L. Moore & Sons Company of the same city.— E. B. Waite is instructor in Mechanical Engineering, American School of Correspondence, at Armour Institute, Chicago, Ill.— C. W. Bowles is surveying at Buckley, Wash. His permanent address is 401 South G Street, Tacoma.

1895.

GEORGE W. HAYDEN, *Sec.*, 493 Warren Street, Roxbury, Mass.

On February 2 a number of '95 men gathered at the Technology Club for an informal dinner and good time. Those present were: Booth, Chase, Jackson, Hurd, A. D. Fuller, Abbott, Dickerman, Gardiner, J. W. Cooke, Howard, C. M. Adams, Hayden, Haven, Watkins, Hannah, Winkley, and Richards. It is the intention to have an informal gathering of this kind on the first Monday of each month at the Technology Club, and all '95 men around Boston are urged to be present as often as possible. '95 men coming from distant points are urged to notify the secretary. A number of our men are now reserving Wednesday

of each week to lunch together, and the secretary would be glad to undertake to get some of the Boston men together any time when any of our class come to this city. On March 2 the second monthly gathering at the Technology Club brought out the following men: Parker, Hannah, A. D. Fuller, Gardiner, Howard, J. W. Cooke, Newell, Rockwell, Jackson, and Hayden. The evening was spent in an enjoyable manner playing pool and exchanging experiences.— George A. Cutter is now with the Improved Paper Machinery Company, Nashua, N.H.— Fred W. Draper is superintendent of the Coahuila Mining and Smelting Company, Coahuila, Mex.— Robert D. Farquhar is now located at 140 East 33d Street, New York, N.Y.— F. E. Faxon is with the Adriance Platt Company of Poughkeepsie, N.Y., manufacturers of harvesting machinery.— J. H. Gregory is division engineer, Jersey City Water Supply Company, 299 Main Street, Paterson, N.J.— F. A. Hannah is superintendent of the Crosby Steam Gage and Valve Company, Roland Street, Boston.— L. F. Howard is now inspector of signals and interlocking, Boston Elevated Railway Company.— E. J. Loring is now architectural engineer with the Old Colony & Boston & Northern Street Railways at 147 Milk Street, Boston.— Thomas M. Lothrop has left the telephone business, and is now steam expert, Illinois Steel Company, Joliet, Ill.— F. B. Masters is with the Curtis Publishing Company, Philadelphia, Pa.— John D. J. Moore is doing special engineering work and acting as agent for steam and marine specialties at 45 Liberty Street, New York, N.Y.—C. L. Parmelee is now president General Construction Company, contracting engineers, with office at 136 Liberty Street, New York City.— F. L. Richards is doing engineering work with Densmore and LeClair, Somerville, Mass.— G. A. Rockwell is a member of the firm of Maynardier & Rockwell, lawyers, 101 Tremont Street, Boston.— J. W. Thomas has been made superintendent of the Wyoming Shovel Works, Wyoming, Pa.— C. F. Tillinghast is agent of the Textile Finishing Machinery Company, 19 Exchange Place, Providence, R.I.— H. M. Tucker is a clerk in the custom-house at Honolulu, Hawaiian Islands.—T. H. Wiggin is now in Boston with Leonard Metcalf, consulting en-

gineer, at 14 Beacon Street.— John J. C. Wolfe is with the National Supply Company, 1407 Manhattan Building, New Orleans, La.— Luther K. Yoder is construction engineer with Jones & Laughlin Steel Company, Pittsburg, Pa.— Henry Yoerg is superintendent of shops, Great Northern Railway, Havre, Mont.

1896.

E. S. MANSFIELD, *Sec.*, 70 State Street, Boston.

The eleventh annual meeting and dinner was held at the Technology Club, Friday evening, March 13. The following men were present: Ames, Batchelder, H. W. Brown, Callan, Davis, Dickinson, James Driscoll, Joseph Driscoll, Eynon, F. W. Fuller, Harkness, H. R. Hedge, W. R. Hedge, Henderson, Hersey, Hewett, Hultman, James, Locke, Maclachlan, Mansfield, Nevin, Peirce, Rockwell, and Stearns. The meeting was called to order at 6 P.M. by the secretary. A report on a class constitution was read by Hultman, chairman of the committee appointed at the last meeting; and the class unanimously voted to adopt the constitution as submitted, and to have printed and distributed to members of the class copies of the same. A written ballot resulted in the election of E. S. Mansfield as secretary and J. Arnold Rockwell, M.D., as assistant secretary. It was voted to levy an assessment of $1.00 per capita on all members of the class to cover the years 1903, 1904, and 1905. After the business meeting had adjourned, the members present, with Professor A. E. Burton, Dean of the Institute, as guest, sat down to one of those German dinners which inspire good-fellowship and banish conventionality. Charles E. Locke officiated as toastmaster, introducing as the first speaker Professor Burton, who explained quite at length the duties of a dean of Technology, as well as the character of his relations with the students. He also spoke of some of the recent changes at the Institute, also of some of the plans and future possibilities which may materialize within a given time. Following the very interesting address by the Dean, Toastmaster Locke called upon each member present to relate in a few words any interesting events, business,

or social, which had come within his notice during the year. The responses were hearty and full of wit and information. The occasion was concluded with vocal selections by Walter M. Stearns, followed by a number of songs joined in by all those present. — It has been advised by a number of the class that a monthly '96 night be appointed, at which time members of the class may meet informally at dinner at the Technology Club and spend a social evening together. To bring the matter to a test and give an opportunity for further expression of opinion, the second Monday of each month has been appointed as '96 night, and on April 13 the first social gathering will be held. The regular club dinner will be served at 6.30, and it is hoped a large number will avail themselves of the opportunity of meeting informally other members of the class.— In answer to a letter of inquiry the following was received from L. K. Sager, dated Washington, D.C., March 3, 1903: "It may be of interest to the other members of the class to know that, after taking a course in general law at Georgetown University of this city and having passed the examination, I was admitted to the Supreme Court of the District of Columbia Feb. 18, 1903, and was admitted to the Court of Appeals of the District of Columbia on February 24. I am now taking a post-graduate course in patent law at Columbian University, this city, and will be graduated with a master's degree this spring. I am still in the Patent Office, and six months ago was fortunate enough to secure a transfer to one of the electrical divisions, and now have the examination of applications for improvements in dynamos and motors, as well as parts thereof, galvanometers, ammeters, voltmeters, wattmeters, regulators, and other less important classes. The work is very interesting, and for one who has a liking for patent work the Patent Office presents many advantages." — According to a recent bulletin of the United States Geological Survey, there has been a new division organized for the investigation of underground waters. The eastern half of the country is in charge of M. L. Fuller, '96. The bulletin includes the following note: "A new division, to be known as the Division of Hydrology, has recently been organized in the hydrographic branch of the United States Geological Survey.

The work of this division will include the gathering and filing of well records of all kinds, the study of artesian and other problems relating to underground waters, and the investigation of the stratigraphy of the water-bearing and associated rocks. In addition to the gathering of statistics relating to the flow, cost, etc., of the wells, it is hoped in the future to give especial attention to the geologic features which govern or which are related in any way to the supply of water. The division will be subdivided into two sections, the eastern and the western, the first embracing the Gulf and Mississippi River States and the States to the East, and the second embracing the remaining States and Territories, or those having public lands. The charge of each section has been assigned to a geologist, the western section to Mr. N. H. Darton and the eastern to Mr. M. L. Fuller. The office details are in charge of Mr. Fuller." — Joseph Driscoll returned about the middle of March from a trip to Oregon, where he has been engaged in inspecting mines and mining properties.— F. W. Fuller has been spending a limited vacation in Atlantic City, N. J.— F. C. Hersey, Jr., is the purchasing agent of the Hersey Manufacturing Company, having a factory in South Boston, where they manufacture various kinds of machinery. —L. P. Dickinson is associated with F. A. Laws in the Department of Physics at the Institute, where he will probably remain until the end of the school year.— George E. Stratton, of the United States Harbor and River Commission, has been recently engaged in searching for obstructions in Boston Harbor upon which vessels are liable to strike in entering the harbor.— R. E. Bakenhus at the Navy Yard, League Island, Pa., has charge of outside work on about two and one-half million dollars of contract and day work. He was a member of the Board of Civil Engineer Officers of the Navy to determine the value of the work done in case of annulment of contract for dry dock at League Island.— W. H. Partridge is married and has a child, and is living in Peabody, Mass. He is rector of the Episcopal church in that place.— Albert Chittenden moved from Boston to New York last fall, and now has his studio located at No. 15 West 29th Street, New York, where he is still engaged in drawing and painting.— L. N. Whitney has lately taken a busi-

ness trip through Chicago and the West.— E. H. Robinson is at present division foreman with the New England Telegraph and Telephone Company. His business address is Somerville, Mass., while his residence is at Reading, Mass. Robinson is married and has one child.— Clarence W. Perley is now assistant in the Library of Congress as technological man of the library, with duties and responsibilities in the fields of biology and "The Useful Arts."

1897.

JOHN A. COLLINS, JR., *Sec.*, 79 Tremont Street, Lawrence, Mass.

F. A. Hunnewell, of the Bureau of Construction and Repair, Navy Department, has been transferred to the yards of the New York Ship-building Company at Camden, N.J., where he is chief draughtsman in the office of the superintending constructor for the government.— Proctor L. Dougherty has been elected president of the Washington Society of the Massachusetts Institute of Technology, which, with A. L. Parsons on the executive committee, gives '97 a good showing in the affairs of the society at our national capital.— Joseph Bancroft is secretary and assistant treasurer of the Joseph Bancroft & Son Co., of Wilmington, Del. They are manufacturers, bleachers, and dyers of cotton goods.— Carroll Bennink was married on October 25 to Miss Miriam Hartshorn, of Methuen, Mass. Bennink is engaged in architectural work in San Francisco. Proctor Dougherty, '97, was best man at the wedding.— The Senate on March 19 confirmed the appointment of Archibald L. Parsons, '97, as a civil engineer in the navy. There are now six Institute men in this corps, including J. W. G. Walker, Fred Thompson, '87, Bakenhus, '96, Brownell, '90, and Parsons, '97, appointed in the order named.— The following is from the *Weekly Constitution*, Atlanta, Ga., Nov. 17, 1903: —

In the summer of 1901 the Siamese minister received an official document from his king, in which the latter commanded his representative to secure him forthwith an American, skilled in sanitary engineering, to put Bangkok in a sanitary condition. Mr. Sarasiddhi, in his endeavor to fill his master's

order, sought out his friend, John D. Long, then Secretary of the Navy, told him what he was commissioned to do, and asked the Secretary's advice.

"Oh, just write around to some of the technical institutes," said Mr. Long.

"But where are they, and what are they?" the Siamese minister interrogated.

Mr. Long explained, and named half a dozen institutes.

After he had finished, Mr. Sarasiddhi insisted: —

"But the best one. I want the best one, for I've got to get the best man in the country for the king."

At that Mr. Long's pride in his native State rose in his breast.

"The best one," he stated solemnly to the man from the Orient before him, "is the Massachusetts Institute of Technology."

Siam's representative, duly convinced, bowed himself out with profuse thanks, and immediately posted a letter to the Boston school's president, in which he asked that he be put in touch with the most expert sanitary engineer that the president knew of.

The professor of sanitary engineering wrote in reply that he knew just the man that the king of Siam was looking for, and, in substance, he said: "His name is Edwin P. Osgood. He graduated in 1897, after having made a special and exhaustive study of sanitary engineering. Because of its excellence, his thesis on the sanitary system of Boston brought him high honors in the Institute and praise from all over the country. Indeed, on the strength of his thesis the late Colonel Waring, of New York, just before he died of yellow fever, contracted while cleaning up Havana after its occupation by the American army, was preparing to make Mr. Osgood his chief sanitary engineer." Mr. Osgood, ever since he had left college, had been looking out for an opportunity to engage in sanitary engineering; but, barring the offer from Colonel Waring that death had nullified, he had watched in vain. Now the realization of his ambition seemed at hand, and he wasted no time in responding to the Siamese minister's request to go to Washington for an interview. Incidentally, he took along a hand-bag crammed with gilt-edged recommendations received from well-known men, such as Colonel Waring, with whom he had come in contact in a professional way. These letters of recommendation young Mr. Osgood handed to Mr. Phya Sarasiddhi, who, after carefully reading them through, enthusiastically exclaimed: "Mr. Osgood, I question you no further. We will now draw up the contract!"

From the time of their arrival in Siam, Mr. and Mrs. Osgood have been accorded the favor of the royal family. Although, according to their last letter, they have not yet been presented to the king, many of the princes and princesses of the royal family have given them audiences, and invited them to entertainments in the palaces. Indeed, Mr. Osgood and his wife only recently returned from the royal hunt for sacred white elephants. . . . Bangkok, a city of a million inhabitants, is rapidly being made a healthy place to live in by Mr. Osgood; and his manner of lighting the king's palaces with electricity has much pleased their chief occupant. After his capital has been cleaned and lighted to the king's taste, Mr. Osgood will burnish up some of the other Siamese cities. In the mean time he is working in Bangkok what the minister of state describes to his king as wonders, and thereby has largely influenced his royal highness, Chulalongkorn I., to decide upon his prospective visit to the United States.

1898.

C.-E. A. Winslow., *Sec.*, Hotel Oxford, Boston, Mass.

The plan for a quinquennial reunion in June has met with universal approval, and between fifty-five and sixty members of the class have already signified their intention to be present. Fenner, from Bethlehem, Pa.; Lansingh, from Chicago; Hutchinson, from Anaconda, Mont.; and many New York men,— are in the list. The project includes some sort of excursion on Monday, June 8, with the class dinner in the evening, attendance at the commencement exercises, and at the Technology night popular concert on Tuesday. President Pritchett has promised to be present at the dinner.— A. A. Blanchard, after returning from his studies at Leipzig, has become instructor in chemistry in the New Hampshire College.— D. Q. Brown has been elected a junior member of the American Society of Mechanical Engineers. Brown is actively interested in plans for the June reunion and in the creation of a '98 class fund.— J. S. Bleecker, who is representing Stone & Webster in Seattle, has joined the University Club of that city.— C.-E. A. Winslow had an article on "The War against Disease" in the *Atlantic Monthly* for January. He is to be biologist in charge of a new experiment station for the study of the

bacterial purification of sewage, under the directorship of Professor W. T. Sedgwick of the Biological Department of the Institute.— L. H. Byam writes: "My address is again changed from Buffalo to Jersey Shore, Pa. My present position is supervisor of bridges and buildings of the Pennsylvania division of the N. Y. C. & H. R. R.R. It might be interesting for you to know something of the stability of the positions of a railroad engineer. I personally have moved nine times during the past four years. Strickland is now engaged in locating a railroad for the N. Y. C. &. H. R. R.R. in Western Pennsylvania. His headquarters are at Mahaffey, but I have not had an opportunity to see him yet since he came out here. Horton is now assistant division engineer of the eastern division, with headquarters at Mott Haven." — H. B. Collins was married Sept. 2, 1902, to Miss Georgie Curfman, of Denver. Collins has become prominent in Masonic circles in Colorado.— M. F. Delano's marriage to Miss Helen C. Halladay, of Suffield, Conn., Sept. 26, 1902, has not before been noted in these columns.— F. B. Heathman has opened his own office as an architect in the Davies Building, Dayton, Ohio.— Mrs. J. H. Lambert (Miss M. F. Forrest) is a member of the Association of Collegiate Alumnæ, of the College Club of Lowell, and of the Hospital Guild of the Y. W. C. A.— W. B. Nelson's address is now 80 Livingstone Street, Brooklyn, N.Y. He is still teaching physics in the Manual Training High School.— E. F. Russ and his wife have made their home at the Hemenway Chambers, Westland Avenue, Boston.— P. B. Wesson was married to Miss Edith M. Keith on Oct. 18, 1902.— B. A. Adams has been elected secretary of the New England Association of Teachers of Metal Work.— H. F. Cobb has been recently engaged in the erection of new shops for the Brown Hoisting Machinery Company at Cleveland, Ohio. Cobb is a member of the Cleveland Society of Civil Engineers.— D. C. Fenner announces his engagement to Miss Gertrude Mackensie Smith, of Somerville, N.J. He has been recently engaged in the discovery and development of the Taylor-White process for treating self-hardening tool-steel.— G. D. Huntington has a daughter, Frances Danforth Huntington, born Dec. 21, 1902.

Huntington has been recently in charge of the construction of a new plant for the New York Air Brake Company at Watertown, N.Y.— C. E. Lord has left the United States Patent Office to become patent attorney for the General Electric Company, Schenectady, N.Y. He was married Oct. 29, 1902, to Miss Mary Grace Carroll.— A daughter, Louise Chandler Barker, was born to E. R. Barker on Oct. 1, 1902.— Howard Snelling has left A. D. Fuller's office, and is now in the real estate business.— H. L. Coburn presented a paper on "Steam Piping" before the fourth-year electrical engineers at the M. I. T. on January 7.— J. T. F. Gladding now occupies a position as draughtsman for the Plunger Elevator Company of Worcester, Mass. His address is still 26 Stanwood Street, Providence, R.I.— H. W. Jones, M.D., who has been devoting his time for the past two years to orthopedic surgery, with Dr. E. H. Bradford, of Boston, has now moved to St. Louis.— P. C. Mills is the Eastern Pennsylvania manager for the American Underwriting Company of Boston. He was married Nov. 5, 1902, to Miss Lorena Balliet Adams, and is living at Swarthmore, Pa.— C. H. Pease is in the steel and iron business as a member of the firm of Eastman, Pease & Co., with an office at 12 Pearl Street, Boston.— J. H. A. Smith is now at the Insular Normal School, Rio Piedras, Porto Rico, where he delivers weekly and monthly lectures on physical training. His son, Allen Low Smith, was born Jan. 14, 1902.— Rudolph Tietig is the senior member of the firm of Tietig & Lee, 526 Walnut Street, Cincinnati, Ohio.— G. F. Ulmer lectured at Yale in April, 1902, on "The Sugar Industry," and comes to Technology in April of this year to speak on the same subject.— W. B. Wood has been recently employed in directing the construction of a plant for purifying the dye liquor and wool-washing wastes from the Wanskuck Mills, Providence, R.I.— R. W. Babson, investment bonds and collateral loans, now has his office at Wellesley Hills, Mass.— The office of E. A. Bragg, designer and draughtsman, is now on Medway Street, Milford, Mass. Bragg has a son, Leslie Bartlett Bragg, born Aug. 24, 1902.— R. H. Danforth announces his engagement to Miss D. P. Woodberry, of Beverly, Mass.—

W. D. Hubbard, who is superintendent of water-works and sewers for the town of Concord, Mass., was elected an associate member of the American Society of Civil Engineers last November.— J. G. Leiper, Jr., is practising patent law as a member of the firm of Leiper & Francine, 1094 Drexel Building, Philadelphia.— E. B. Paige has a son, Francis Ellwood Paige, born Oct. 27, 1902.— R. M. Draper is a member of the Montana Society of Engineers as well as of the American Institute of Mining Engineers.— A. L. Goodrich is teaching mechanical drawing and descriptive geometry at the Institute.— V. R. Lansingh has a son, Killian Van Rensselaer Lansingh, IV., born April 3, 1902. Lansingh read a paper before the Western Society of Engineers on "The Engineering of Illumination" in February of the present year.— R. W. Pratt announces his engagement to Miss Elizabeth Southwick, of New York. The marriage is to take place in the spring.— E. Sturtevant is about to publish, with R. H. Howe, Jr., a supplement to their book on "The Birds of Rhode Island," bringing the original work up to date.— N. Watkins is the Honolulu agent for the Globe Navigation Company, Ltd., as well as office manager of the Hawaiian Fertilizer Company.— P. H. Dater is a member of the Rochester Engineering Society and the Rochester Whist Club.— L. D. Higgins has written a text-book in physics, which is shortly to be published by Ginn & Co.— E. C. Little is an architectural draughtsman with Isaac S. Taylor, 905 Columbia Building, St. Louis, Mo. Little has joined the Architectural Clubs of St. Louis and Chicago.— C. W. Pen Dell, who is now assistant signal engineer of the Santa Fé Railway at Cleburne, Tex., was married Oct. 8, 1902, to Miss Flora A. Towle, of Lowell, Mass.— W. W. Stevens is the editor of the series of articles in the REVIEW on the openings for Technology men in the government service.— N. C. Walpole has two sons, Charles Carroll and Nathaniel C. Walpole. He is at 119 Greenwood Avenue, Dallas, Tex.— G. E. Matthews was married to Miss Dorothy M. Manning on Nov. 25, 1902.— E. B. Richardson announces his engagement to Miss Elsie G. Pillsbury. Richardson is a member of the New Riding Club and of the Puritan Club of Boston.— C. M. Swan has been appointed

Assistant in Physics at the Institute.— Mark E. Taylor is active in many good causes, being a member of the Hyde Park Presbyterian church and Christian Endeavor Society and of the Cambridge Y. M. C. A.— Miss S. Usher is an instructor in Simmons College, the new technical school for women.— R. B. Wallace is chief of the mill department of the American Ship-building Company of Cleveland, Ohio. He was married on June 24, 1902.— Frank B. Perry is mechanical and mill engineer with Howard & Bullough, American Machine Company; and his address is 1 Federal Street, Providence.

1899.

HARRY L. MORSE, *Sec.*, Technology Club, Boston, Mass.

Mr. and Mrs. Charles E. Fay announced the marriage of their daughter, Ethel Lincoln, to Mr. Thomas Pendleton Robinson on Wednesday, February 4.— The business that took Walter Adams from the secretaryship is giving promise of a very successful future, since unusual and very clever features in his carriages are creating a large demand.— Incidentally, your present secretary is now tied up to a motor car company, the Pope-Robinson of Hyde Park. J. T. Robinson, Jr., '98, is prominent in the company.— F. M. Blake has left the Sturtevant Company to take a position as inspector for the Underwriters' Bureau of New England.— K. M. Blake is last reported as selling many automobiles to the Shah of Persia.— George Lynch has left the Sullivan Machinery Company to take charge of the design and erection of plants to manufacture mining machinery at Denver and Littleton, Col. He writes: "We are building a new shop out at Littleton,— twelve miles from Denver, and it's going to be strictly up to date. I have to design a line of hoisting engines and fans, and shall probably spend some months inspecting plants throughout the West to get data on the best construction. There is a good field for electrical engineers out here." He is now living at the Hotel Belvidere, 429 15th Street, Denver, Col.— Arthur Hamilton and Fred Snow are '99's most faithful representatives at the Technology Club of late.— The secretary

wishes to call the attention of the class to the fact that not one-half have notified him of their latest and correct address. This should be considered the first duty after any change, as only a close observance of this practice can prevent a rapid disintegration of the class.— Clancey M. Lewis, professor of mining engineering in the Christian College in China, writes to Professor Richards, in part, as follows: "When I arrived on the field, I found the college work just in its infancy. There were a few scholars in the school, which had just begun its second year on the 1st of March, 1900, a week before my arrival. The 'troubles of 1900' drove us away from Canton, and broke up the work to some extent. We came to Macao with six boys to wait for quieter times, and have been here since. We have been hard at work all the time, each year taking in a new class. There are now three well-organized classes in what we call the 'Preparatory Department.' These correspond to about the last year in the grammar school, and the first two years in the high school. We have fifty students with us this year. Since the *coup d'état* of 1900 the drawback to the work has been the inability to secure a proper site in Canton. We are now reporting progress along that line. We have made the first payment upon a most desirable site along one of the principal waterways to Hong Kong, and about three miles from the city of Canton proper. The actual work of my department is about three years ahead. Of course I have now the preparatory work leading up to it. This does not mean, however, that I am cut off entirely from professional work. I am doing something at it most of the time, and always trying to keep up my studies and abreast of the times through the journals. I have had several calls to outside work; and, had I been in shape for assaying, I should have had my hands full. As soon as we get to Canton, I shall put in a laboratory for the private investigation of the different mineralized sections of the Province. There are a few of what, I think, will make good mining sections in this Province as soon as cheap and efficient transportation can be secured. Railroads are needed. Native mining well written up would make good reading for a funny paper. Native mining companies are to be avoided as much as the American

'fakes' or 'wild cats.' The largest company in South China, and the only one that made pretensions to foreign methods, signed bankruptcy papers in Hong Kong two weeks ago. . . . The language has taken much of my time and energy. I feel that a working knowledge of the language will greatly increase my efficiency."

1900.

GEORGE EDMOND RUSSELL, *Sec.*, 25 Broad Street, New York, N.Y.

The amount of news from the class in this issue is unusually meagre, but lack of personal contact with the men is the only excuse.— The marriage of Paul Leon Price and Miss Roxanna M. Stuart, of Harlam, Ia., was announced on Jan. 22, 1903. Mr. and Mrs. Price reside at Middletown, Conn. The groom's many friends of "auld lang syne" join in heartiest congratulations and best wishes.— Mr. C. L. Richardson (Course I.) is again a familiar figure in New York after a sojourn in Kalamazoo, Mich., where he went to oversee the erection of a large paper mill for the firm of J. H. Wallace of this city.— Percival C. Clow (Course I.) is with the contracting firm of Milliken Brothers, 11 Broadway, New York City, as steel designer and draughtsman. — Stanley G. H. Fitch is now auditor of the Vaughn Machine Company of Peabody, Mass.

1901.

FREDERIC W. FREEMAN, *Sec.*, West Newton, Mass.

Twenty-two members of the class of 1901 met at the Tech Union on Garrison Street on the evening of February 16 for an informal supper and smoker. The guests of the evening were Mr. Burrison and Mr. Blachstein; and their talks, which followed a very good supper, were much enjoyed by all present. The evening was a very successful one; and it is the intention of the 1901 men about Boston to meet at the Union in this way about once a month.— John T. Scully's friends will be pleased to hear the announcement of his marriage to Miss Baize A. Byrne, of New

York. The wedding took place at the home of the bride on the evening of December 29. Mr. and Mrs. Scully are residing now in Allston.— H. E. Dart, who has been till lately Assistant in Electrical Measurements at the Institute, has recently accepted a position in the West.— C. G. Tufts has also left the Institute, and is now located in Binghamton, N.Y.— F. K. Baxter has left the Maryland Steel Company for a position in a gold mining company in Breckenridge, Col.— A. H. B. Jeffords is with the Philadelphia Pottery Company.— The engagement of Miss Blanche Estelle Lincoln to Willard Wellman Dow is announced.— On account of a tardiness in sending out the annual circulars there is no further class news to publish at the present writing.

1902.

CHARLES W. KELLOGG, JR., *Sec.*, 51 St. Paul Street, Brookline.

By far the most interesting news item from 1902 for the last quarter is the class dinner and annual meeting which was held at the new Tech Union on Garrison Street February 20. Fifty-two were present, including Dean Burton. After the dinner, where good cheer and beer were in abundance, the Dean gave those present an excellent talk, full of good advice and encouragement. Then followed a pleasant hour of singing, with Grant at the piano. All the modern tunes, from "Rip Van Winkle was a Lucky Man" to "Auld Lang Syne," had been arranged on a sheet together; and every stanza of each was sung with great gusto. Following a time-honored custom, the average salary was computed (excluding from the competition all who were still a burden to their families, such as graduate and undergraduate students). The result showed a mean of $793, with a maximum of $2,500 and minimum of $500. The following officers were elected for the ensuing year: president, W. J. Mixter; first vice-president, W. R. Greeley; second vice-president, C. E. McCarthy; assistant secretary, A. H. Nickerson. The names of those present at the dinner are Reynolds, Kellogg, Baker (E. S. and J. McF.), Wood, Adams, Currey, Taylor (G. S.), Grant, Mendenhall, Franklin (R. S.), Nelson (E. E.), Capen,

Ames, Fitch, Starr, Gardner (A.), Ballard, Williams (R. S.), Collier, Borden, Nash, Nickerson, Gallaher, Mixter (C. G. and W. J.), Field, Whittet, Belcher, Pendergast, Millar, Manley, Brown (R. V.), Sawyer (C. A., Jr.), Hunter, Pember, Wales, Wright, Philbrick, (B. G. and J.), Stimson, Vatter, Westcott, Wemyss, Finneran, Wetherbee, Davis, Randall, McDonnell, McCarthy. An interesting question was definitely answered at the dinner; namely, Who was the first man in the class to get married? The successful claimant to priority is G. M. Wetherbee, who married Miss Daisy Beem on June 19, 1901. Wetherbee is the father of a daughter, Vivian Meserve, born on Sept. 6, 1902. The "class boy" has yet to appear. The following items have reached the secretary since the last publication of the REVIEW: L. W. Millar is now with the Boston Wharf Company, 274 A Street, Boston.— F. J. Field is with Densmore & LeClear, 15 Exchange Street, Boston. His home address is 216 Dorchester Avenue, Boston.— H. B. Barry's address is 280 Washington Street, Chelsea.— J. L. Taylor, Jr., has moved across the river to Pittsburg. He lives at 1013 Penn Avenue.— T. H. Taft is assistant to William O. Webber, mechanical engineer, 423 Exchange Building, Boston.— L. E. Williams is assistant master mechanic in the Lake Superior Contracting and Dredging Company, West Superior, Wis.— E. S. Baker lives at 26 School Street, Dedham.— Harold Blanchard is at 2224 Deirsadero Street, San Francisco, Cal.— T. W. Foote is a melter in the Open Hearth Department (South Works) of the Illinois Steel Company, Chicago.— G. T. Paraschos is a civil engineer on the Reyée des Tabacs, Constantinople, Turkey.— T. A. Finneran is at 28 Fisher Avenue, Boston.— K. C. Grant lives at 42 Rutland Square, Boston.— Lloyd B. Haworth is with the Merrimack Manufacturing Company, Lowell, Mass.— H. N. Hudson is care of J. J. Gurn's Sons, Mulberry Street, Lynn, Mass.— A. A. Jackson is with the Southern Cotton Oil Company, Augusta, Ga.— W. H. M. Latshaw is a chemist with the Colorado Fuel and Iron Company at Pueblo, Col. Address, 411 West 13th Street, Pueblo.— H. B. Litchman's address is Box 940, Marblehead, Mass.— A. E. Lombard has left Boston for Kansas

City, Mo. His address there is 1805 Jefferson Street.— J. R. Morse is now with Stone & Webster, 93 Federal Street, Boston.— B. G. and J. Philbrick live at 131 Pembroke Street, Boston.— H. H. Saylor lives at 351 King Street, Pottstown, Pa.— H. L. Sherman is with the Helderberg Cement Company, Hawes' Cave, N.Y.— A. M. Hamblet has left the Fertilizer Company in Elizabethtown, N.J., and has gone to Rumford Falls, Me., where he is chemist with the Oxford Paper Company.— August Ernest Hansen was married to Miss Ethel Porter at Springfield, Mass., on June 12, 1902.

BOOK REVIEWS

THE ROENTGEN RAYS IN MEDICINE AND SURGERY, AS AN AID TO DIAGNOSIS AND AS A THERAPEUTIC AGENT

By Francis H. Williams, M.D. (Harvard) (M. I. T. '73). Second edition. New York: The Macmillan Company, 1902.

This volume is an octavo of 704 pages with 410 illustrations. It is too early in the history of X-ray work to expect an exhaustive and complete treatise, and the author regards this book as a "report of progress" rather than a final presentation of the subject.

Dr. Williams is abundantly qualified to speak, as he was one of the first to use Röntgen rays in this country; and his early technical training, large experience, and scientific methods have made him an authority. He acknowledges his indebtedness to Professor Cross, the late Professor Holman, and other members of the Department of Physics at the Institute for their valuable assistance.

This is a book of great value, not only to medical men, but also to those who wish only to get a general knowledge of the progress made in using the X-rays in medicine and surgery. The value of their application to fractures and dislocations, and in determining the presence of foreign bodies, such as bullets, is common knowledge. There are many other applications described which are less well known. It is a method of diagnosis with a wide future.

It was the author's intention to include a complete list of medical and surgical X-ray publications to date, but these were omitted from lack of space. The book is mainly a record of Dr. Williams's own experience and conclusions, and its value lies chiefly in its wealth of original observation. A large number of case records have been included, in order, evidently, that the basis for the author's deductions in this new field shall be apparent to all. Dr. Williams's judicial treatment of his results inspires the fullest confidence in his conclusions. Not only pathological, but physiological data are considered, such as the size of the heart and the movement of

the diaphragm; and the author emphasizes the importance of a knowledge of the phenomena of health before attempting the interpretation of abnormal conditions.

Great wisdom is shown, while emphasizing frequently the value of examination by the X-rays, in acknowledging the value of all other means of diagnosis, and presenting it as an aid to precede or follow other methods of examination.

The exhaustion of the first edition in three months testifies to the general appreciation of this work. The second edition differs from the first chiefly in the addition of forty pages devoted to apparatus and to therapeutic uses.

The scope of the book covers the whole field of Röntgen rays in medicine. The subject-matter may be grouped under five heads,—apparatus, the medical, surgical, therapeutic, and miscellaneous uses.

The description of apparatus is of great value to those interested in the practical side of the subject. The static machine and induction coil are both considered, and the mechanism of both carefully described, including tubes, tube-holders, fluoroscope, and methods of examination and record.

Diseases of the thorax are considered at length, with methods and interpretations of results, and with a separate chapter for each of the most important diseases. A description of the appearances in the normal thorax is introductory to the diseased conditions.

The chapter on pulmonary tuberculosis is a long and interesting one. We cannot overestimate the value to both patients and community of the early recognition of this, our most common and fatal disease. With the use of the X-ray in connection with other methods of examination, this disease in its early stages will be less frequently overlooked. The author emphasizes the importance of all aids in its diagnosis, X-ray examinations as well as auscultation and percussion of the chest, and says: "We may thus not only control one method by another, but, with the eye supporting the ear, we also control one sense by another."

There are also chapters on pneumonia, bronchitis and pleurisy, hydrothorax, and pneumothorax. Next come the heart, normal

and diseased, thoracic aneurisms and new growths. These chapters show that the X-ray is of much value in the differential diagnosis of thoracic disease, and gives us much information which it is difficult or impossible to get in other ways, such as evidence of early phthisis, a central pneumonia, an aneurism or cardiac enlargement and malposition.

The author shows that in abdominal disease the use of the ray is less satisfactory than in affections of the thorax. Methods are given for determining the shape and position of the stomach.

The therapeutic use of the Röntgen rays is in the experimental stage. The experience of the author and others is fully given up to date. Cases show their beneficial effect on lupus, superficial cancer, and other skin diseases; and the dangers of dermatitis are considered. Most commendable reserve is shown in reporting only results and avoiding generalizations, in spite of the very encouraging character of the results. The question whether or not the X-rays are likely to replace the knife in the excision of operable growths will be decided largely by the cost and difficulty of using the apparatus and the length of time necessary for treatment.

In surgery the application of the X-rays is more familiar. Their use in the following conditions is described: in fractures and dislocations, in diseases of bones and joints, in dentistry, and in the detection of foreign bodies and calculi. The chapter on dental surgery shows their value in detecting unerupted teeth, fracture of roots, and fluid in the antrum. These details were practically beyond the positive knowledge of the dental surgeon before the time of X-rays.

Internal medicine receives twice as many pages as surgery, in which X-ray work is more familiar. This complete treatment of the newer field renders the work all the more valuable.

The book closes with a chapter on the usefulness of X-ray examinations to life insurance companies and in medico-legal cases.

The type and paper are good, the illustrations are many, are always introduced for a definite purpose, and serve to make clear the important points which the author wishes to emphasize. With a few exceptions the illustrations are of excellent quality.

The author has done the medical profession a real service in producing a work of this character.

FRANKLIN W. WHITE, '90.

GENERAL PRINCIPLES OF PHYSICAL SCIENCE

BY ARTHUR A. NOYES (M. I. T. '86). New York: Henry Holt & Co. pp. 172.

This work forms the first part of a projected treatise on the General Principles of Chemistry, the completion of which has been for the present indefinitely postponed. The part now published is, however, complete in itself, and is the best introduction to the serious study of physical chemistry with which the reviewer is acquainted. The title indicates the general scope of the work, which is divided into the following chapters: I., The Object, Methods, and Subdivisions of Science; II., The Fundamental Concepts of Physical Science; III., The General Principles relating to Matter; and IV., The General Principles relating to Energy.

The treatment is essentially non-mathematical, although an elementary knowledge of the calculus is assumed. The various terms and concepts employed are defined with unusual care and precision, and teachers particularly will be much struck with the originality of their presentation. To fully appreciate the purely physical side of the work, a good knowledge of general physics is essential, as the treatment is very condensed. Those parts having a distinctly chemical bearing, on the other hand, are much more fully discussed and are illustrated by numerous examples. Nevertheless, the precision of statement, which makes the work of great value to the advanced student and teacher, makes it correspondingly hard for the beginner, and, as a class-room text book, it must be considered decidedly difficult.

Space will permit us to point out only a few of the many excellences and novelties with which one is impressed on reading this book. In the opening chapter the object of science is stated to be "to make the completest possible presentation of natural phenomena

in such a manner that a knowledge of them can be acquired with the least possible expenditure of effort." The inductive and deductive methods by which this object is attained are next discussed and illustrated, and the value, together with the dangers, of hypotheses and theories very clearly pointed out.

Chapter II. treats of the fundamental concepts of Physical Science, the concepts adopted being *space*, *time*, *matter*, and *energy*. In this connection it is interesting to note that the author does not accept the view held by Ostwald; namely, that matter is an aggregate of energies, and hence not a fundamental concept in the sense which energy is, but holds to the view accepted by the majority of physicists of to-day. Both Holman and the author define energy by a criterion for its detection, although the criterion postulated by each is different. The former defines energy as "anything which produces a change in the state of motion or rest of a body." The definition given by Noyes is, "energy is that which gives rise to the changes in the properties of bodies and to the power to produce such changes." A comparison of these criteria is interesting as reflecting the respective points of view with which the concept is regarded by a physicist and a chemist.

The rest of the book naturally divides itself into two parts, treating respectively of the general principles relating to matter and to energy. In discussing the concepts of mass and weight, the value of the term "kinergety," proposed by Holman for the capacity of a body for kinetic energy, is recognized; but the author adheres to the usage of leading chemists, and continues to employ the term "weight" in the sense of quantity of matter. The sections dealing with the states of aggregation and other physical states of matter and on chemical substances are unusually complete, and include a splendid discussion of mixtures, suspensions, emulsions, colloidal or pseudo-solutions and true solutions, together with methods for the separation of their constituents. Gibbs's concept of phases is also very properly introduced here. The concluding sections on matter treat in detail of the laws relating to gases, by means of which the author leads up to the concept of molecular weight. All hypotheses and theories are excluded from this part of the work, and the

fact that the results and laws arrived at are inductively derived from experimental data is continually kept before the reader.

The last chapter on energy is perhaps the most interesting, as it is certainly not the least original part of the work. The classification of the forms of energy associated with matter which is adopted by the author is the following: 1. Kinetic; 2. Gravitation; 3. Cohesion; 4. Disgregation; 5. Electrical; 6. Magnetic; 7. Chemical; 8. Heat. To these must be added Radiant Energy, the one form which is unassociated with matter. The classification differs slightly from those of other well-known writers, in the introduction of the term cohesion and disgregation energy to designate the forms of energy which a body possesses in virtue of the tendency of its particles to approach or to recede from one another respectively. These manifest themselves as distance, surface, or volume energies, which collectively are designated as space energies by Ostwald. The author follows Ostwald in his discussion of the measurement of the different forms of energy; *i.e.*, in regarding energy always as a product of an *intensity* and a *capacity* factor. Each of these factors is discussed for each form of energy, together with methods for its respective measurement, special care being taken to accurately define all the units involved. This portion of the subject forms an admirable review for students in physics.

The concluding section deals with the second law of energetics. For a non-mathematical exposition of the second law and particularly of the essence of reversible processes, this treatment is, for simplicity and clearness, the best which the reviewer has ever seen. The only omission to be regretted is some reference to the principle of free energy (which, though really explained, is not mentioned as such) and to the entropy criterion. A comprehension of these terms is highly desirable for all students of physical chemistry, since they are of such frequent occurrence in modern thermodynamics.

One other praiseworthy point should be mentioned; namely, the attempt to introduce a uniform and systematic nomenclature for physico-chemical quantities, which shall be in agreement, so far as may be, with the best current usage. Uniformity in this regard by

other writers is a thing much to be desired. The book is provided with a good index and a valuable list of references, which were consulted in the preparation of the work and in the selection of the value of the constants therein adopted.

The author is to be most heartily congratulated on the first part of a work which, when completed, will be unquestionably the standard treatise in the English language on theoretical chemistry. That he may see his way to finish in the near future this work so admirably begun will be the earnest wish of every one.

H. M. Goodwin, '90.